Central Valley Selenium Control Program

North Bay Selenium Advisory Committee Meeting

1 April 2008

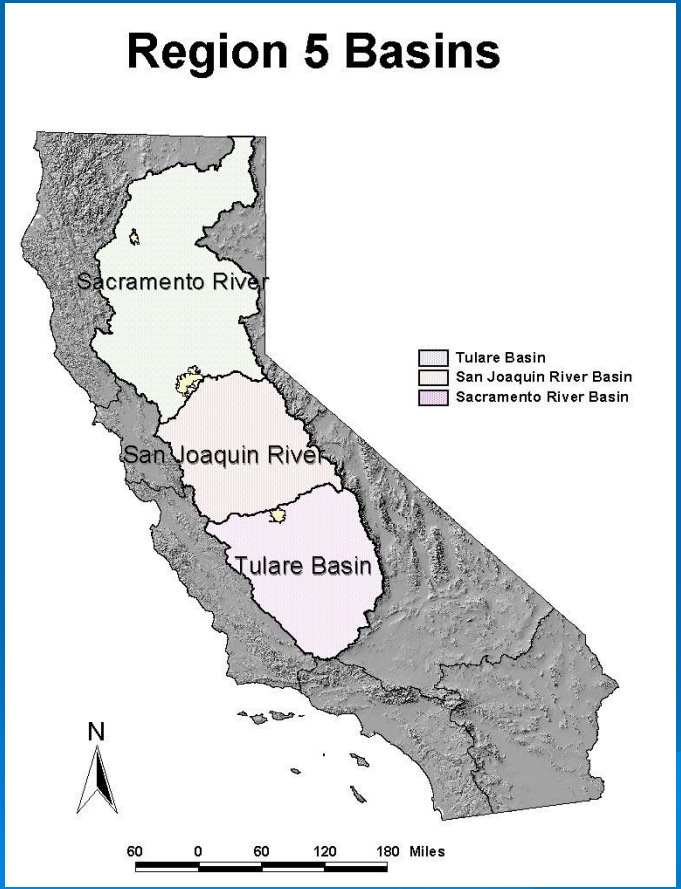
Jeanne Chilcott and Rudy Schnagl

RWQCB – Central Valley

Overview

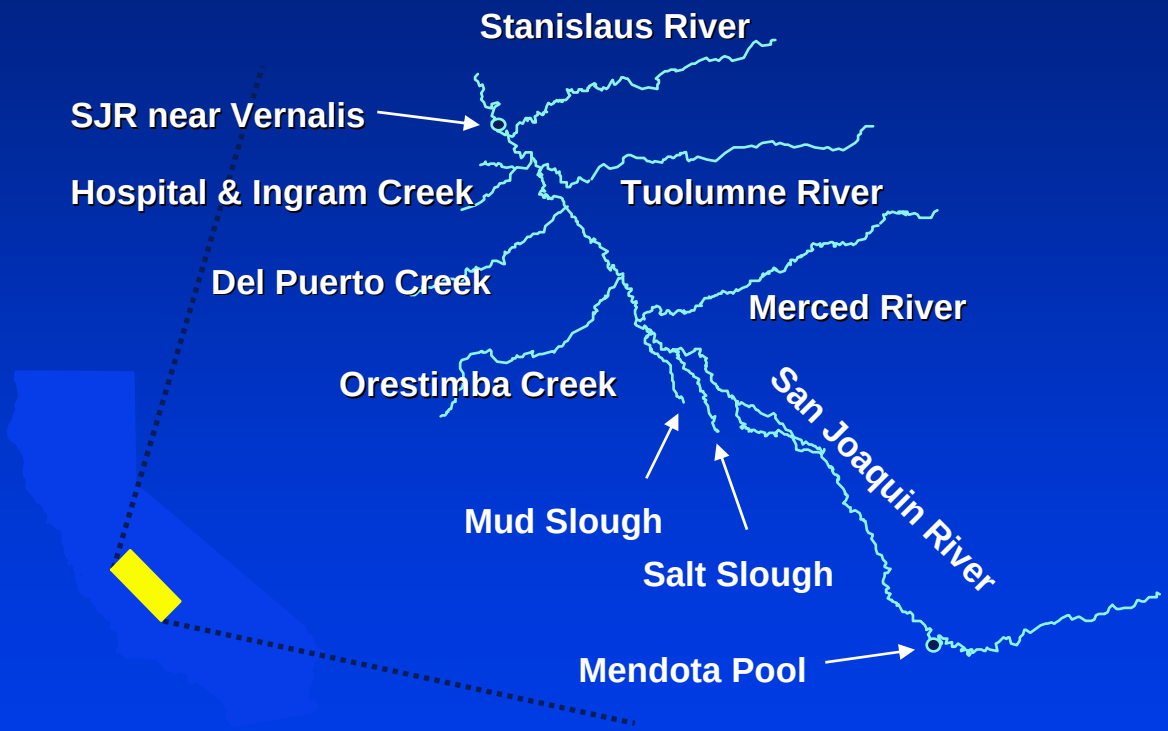
- Background and History
- Project Performance to Date
- Future Activities

Central Valley Region

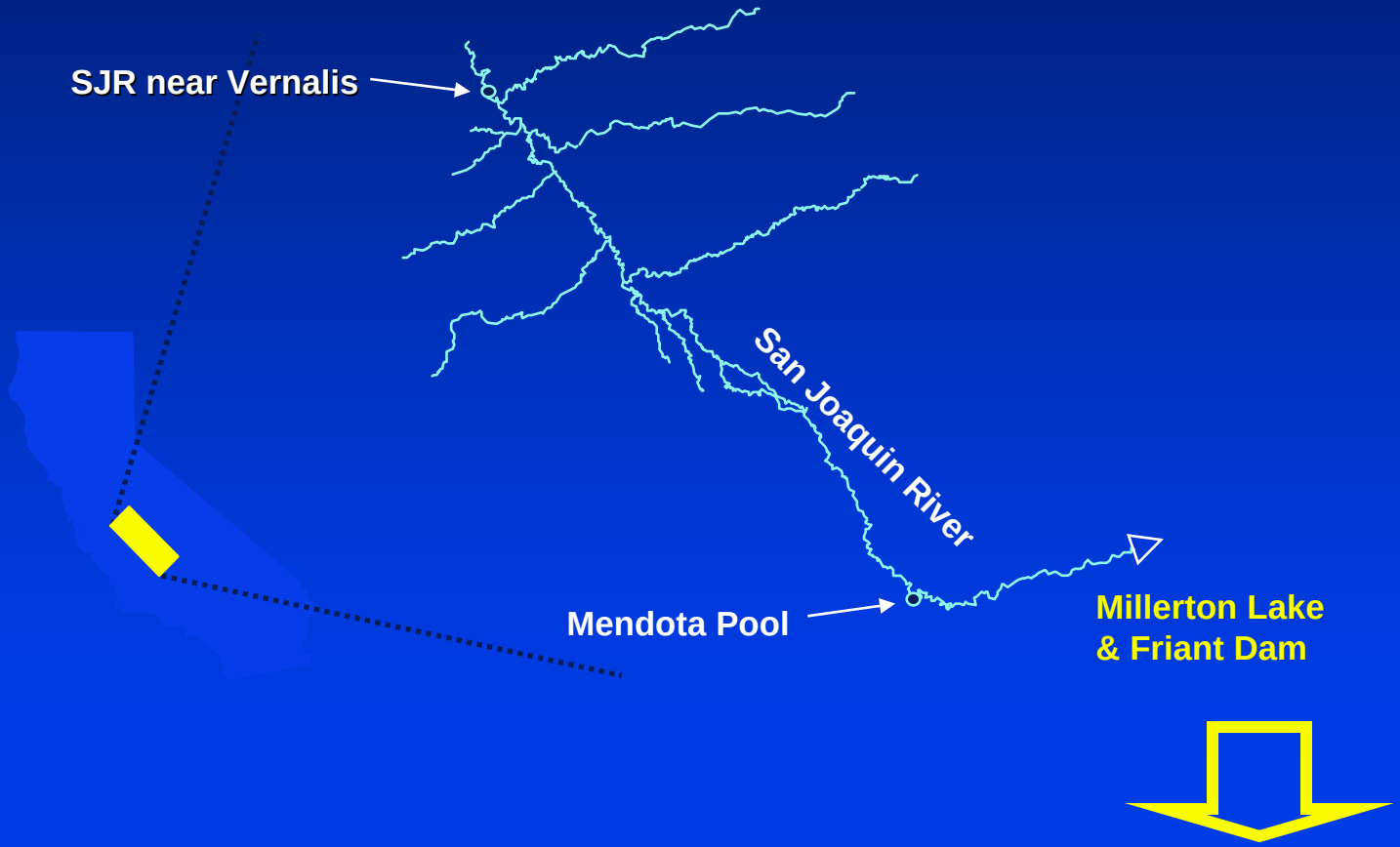


- 40% land surface
- >50% managed water supply
- 77% irrigated agriculture
- 3-Distinct Basins

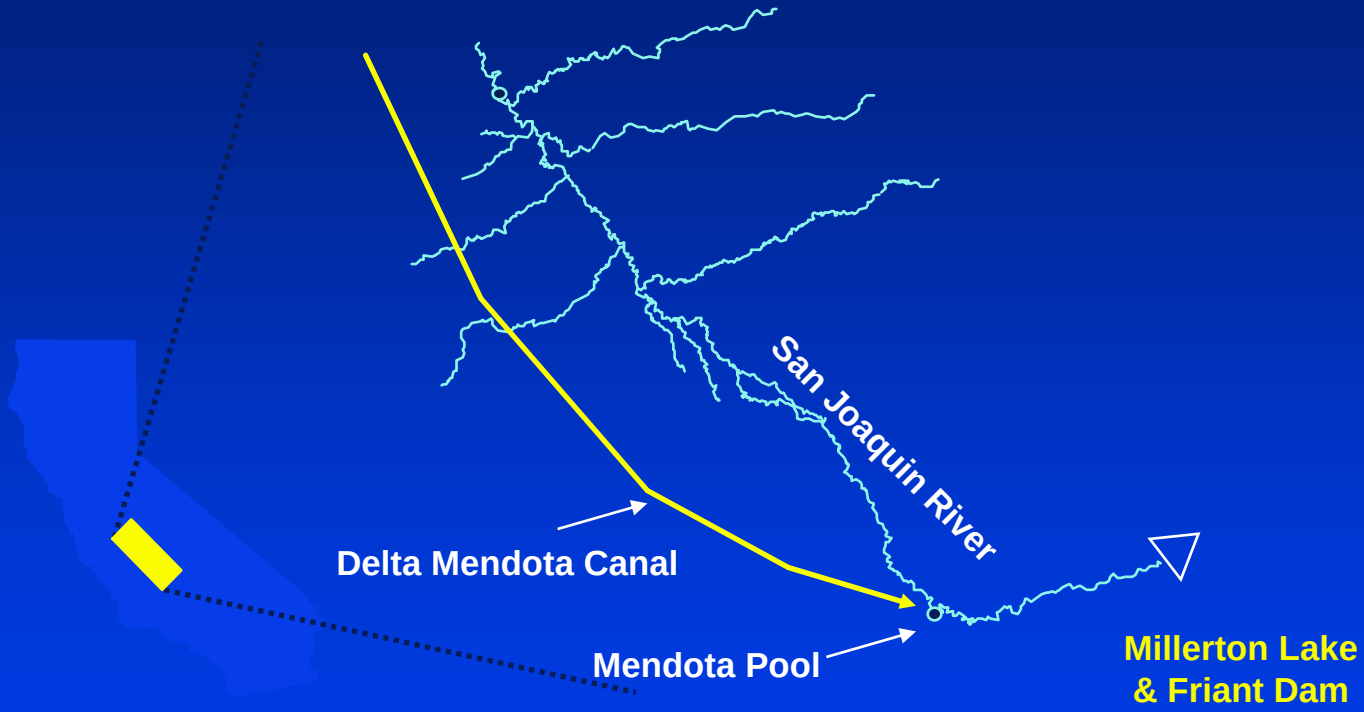
Lower San Joaquin River Basin



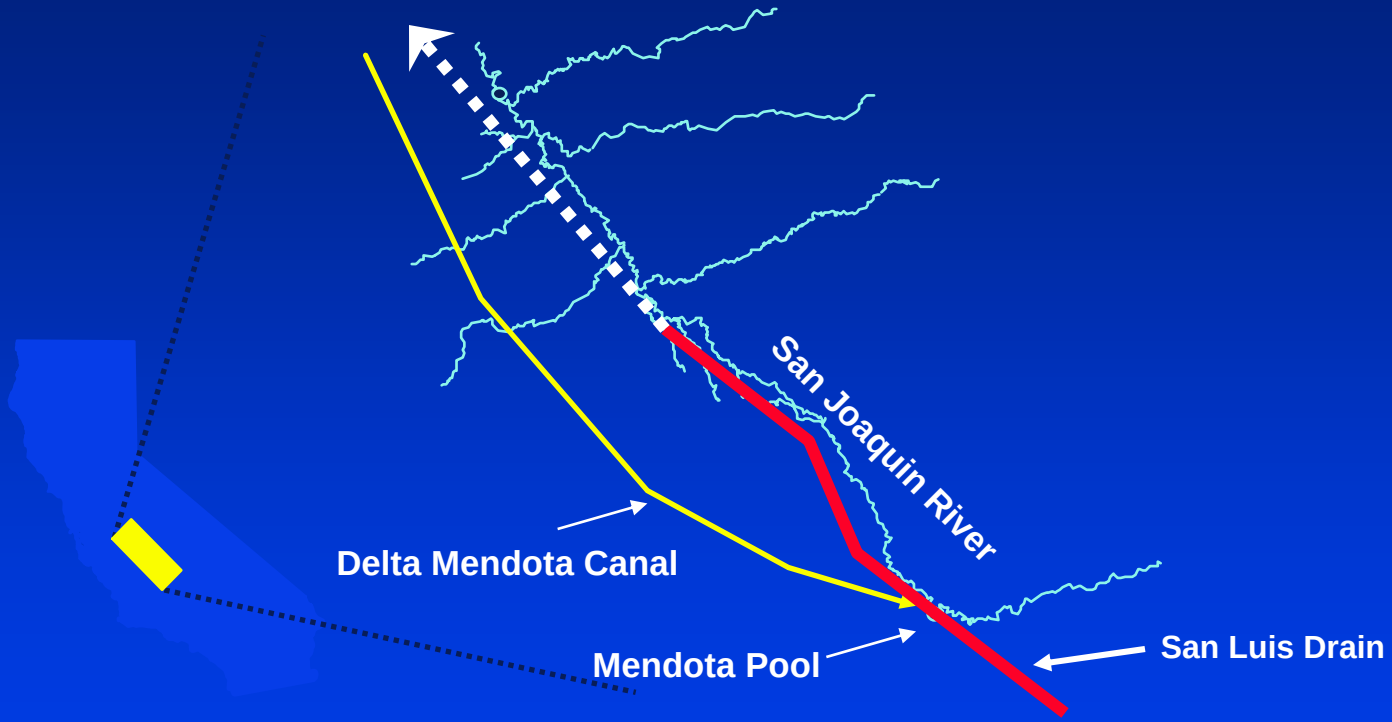
Lower San Joaquin River Basin



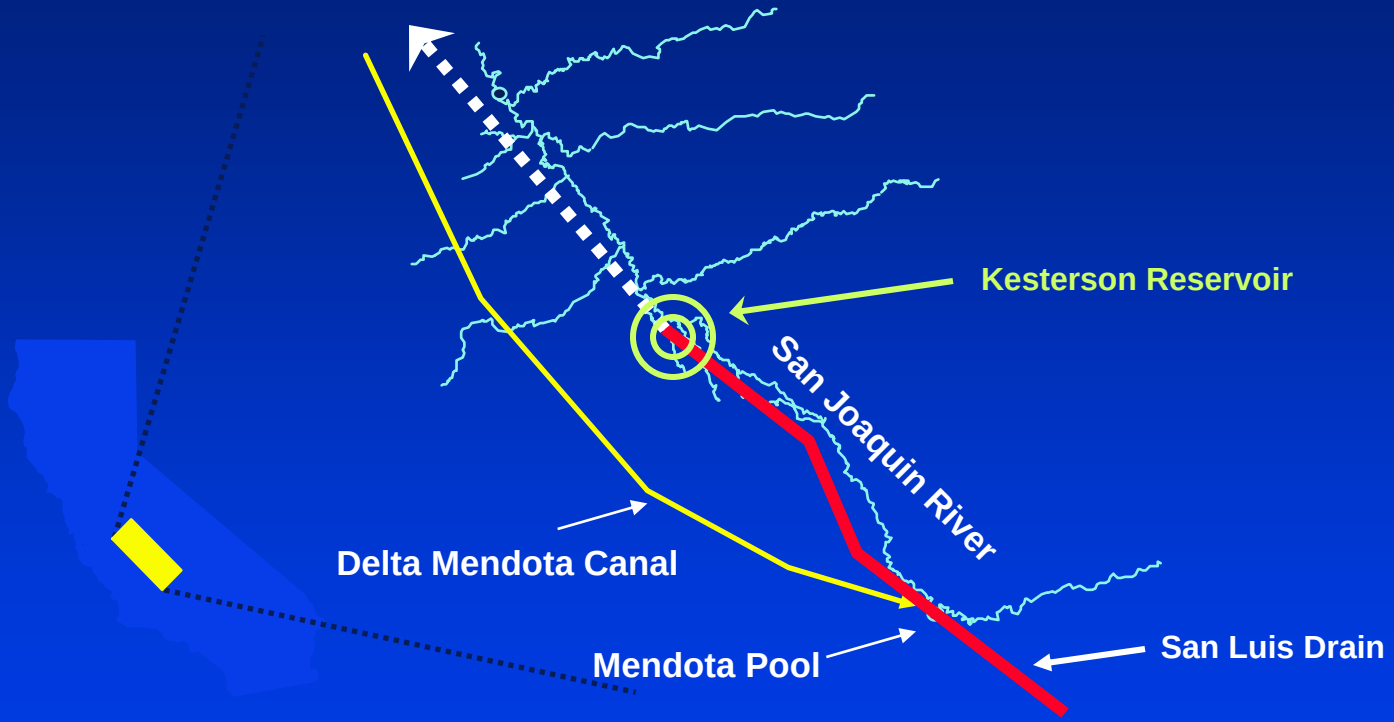
Lower San Joaquin River Basin



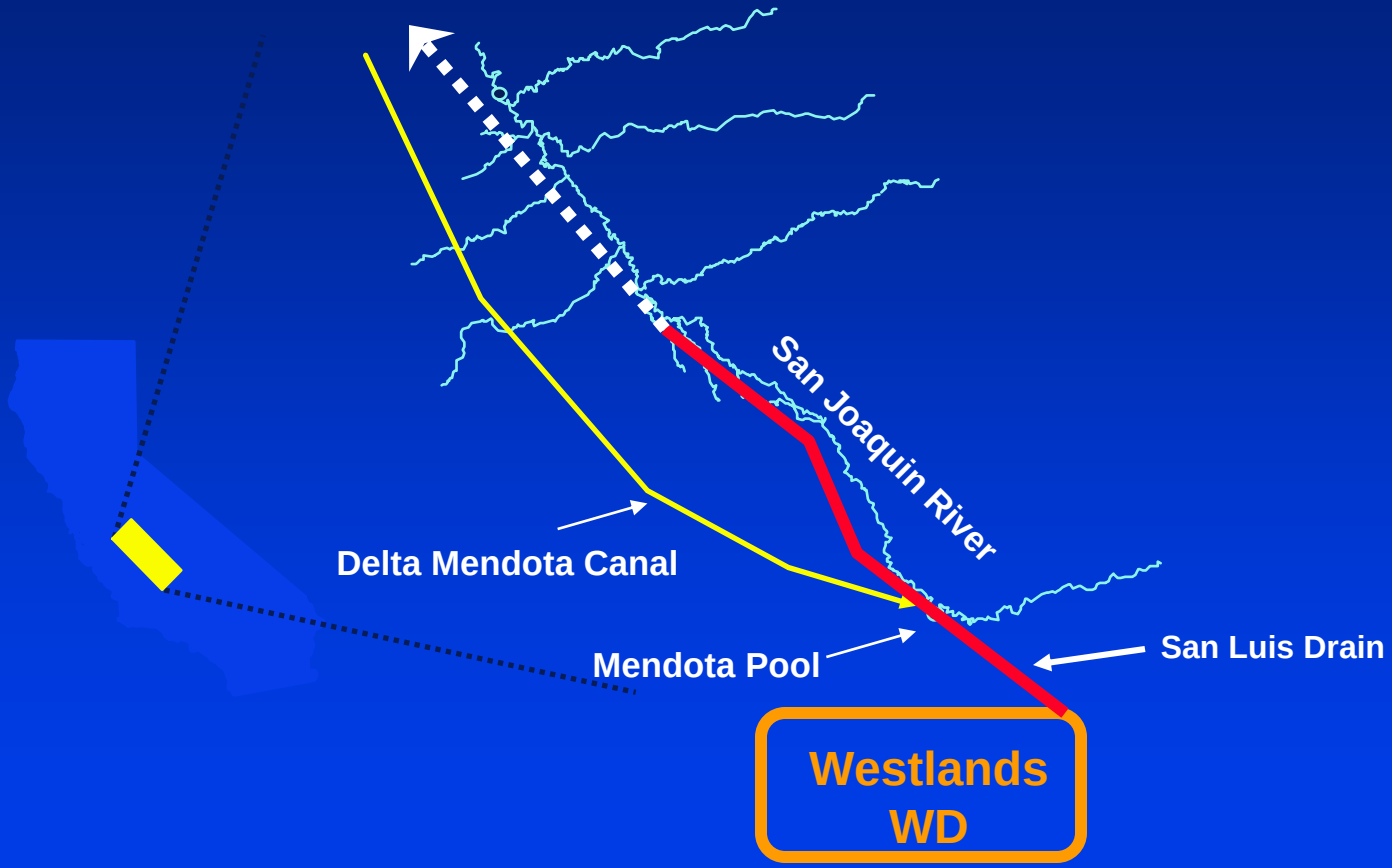
Lower San Joaquin River Basin

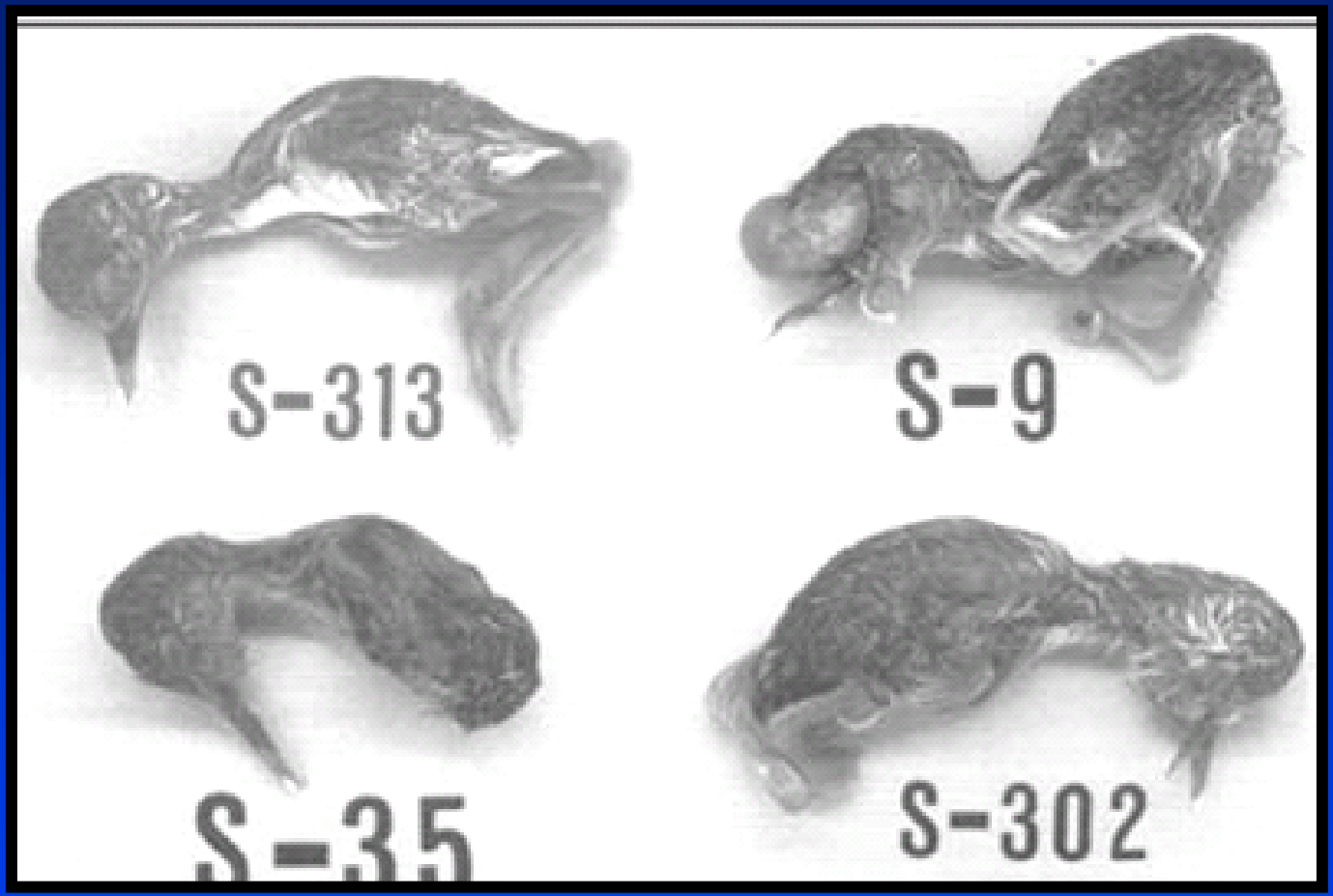


Lower San Joaquin River Basin

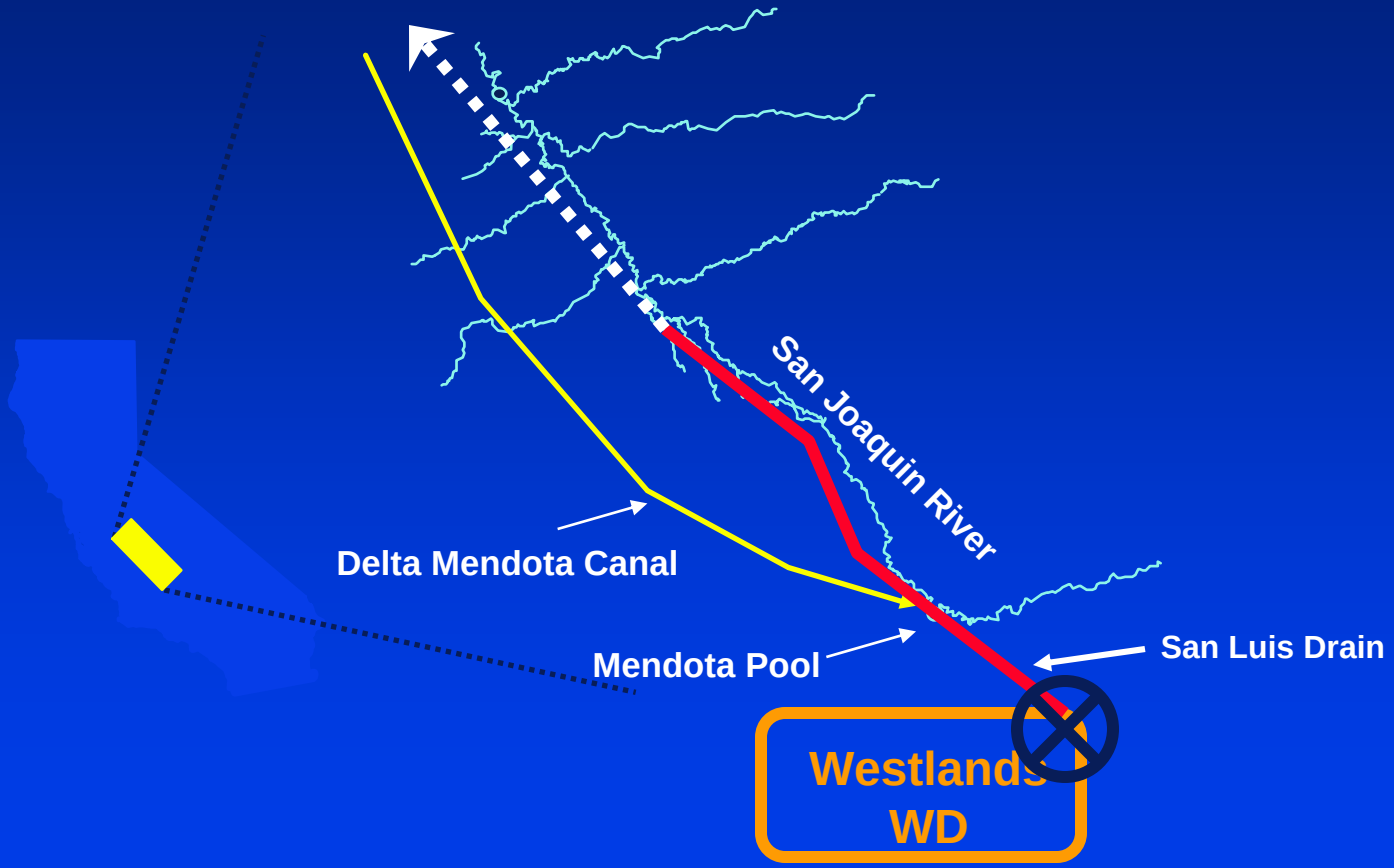


Lower San Joaquin River Basin

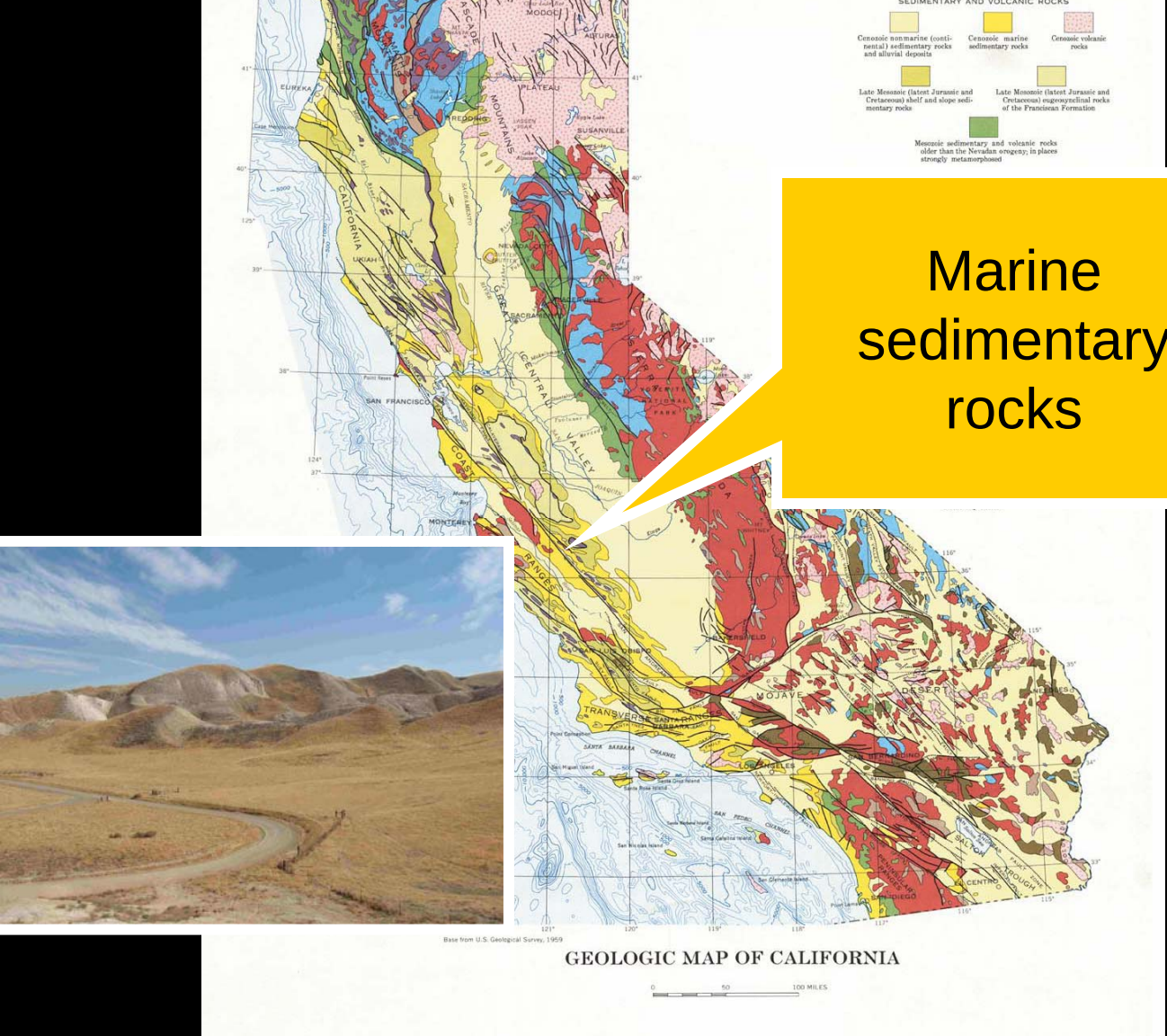



S-313
S-9
S-35
S-302

Lower San Joaquin River Basin



Issue: Are other areas in the Central Valley contaminated with Selenium?


SEDIMENTARY AND VOLCANIC ROCKS
Cenozoic nonmarine (continental) sedimentary rocks and alluvial deposits
Cenozoic marine sedimentary rocks
Cenozoic volcanic rocks
Late Mesozoic (latest Jurassic and Cretaceous) shelf and slope sedimentary rocks
Late Mesozoic (latest Jurassic and Cretaceous) eugeosynclinal rocks of the Franciscan Formation
Mesozoic sedimentary and volcanic rocks older than the Nevadan orogeny; in places strongly metamorphosed
Marine sedimentary rocks
Base from U.S. Geological Survey, 1959
GEOLOGIC MAP OF CALIFORNIA
0 50 100 MILES

Selenium Source Identification

Set up surveys throughout Central Valley (1984)

- All tributaries w/special focus on areas draining ground water

Found two hotspots:

1. Tulare Lake Basin
2. Grassland Watershed

Tulare Lake Basin

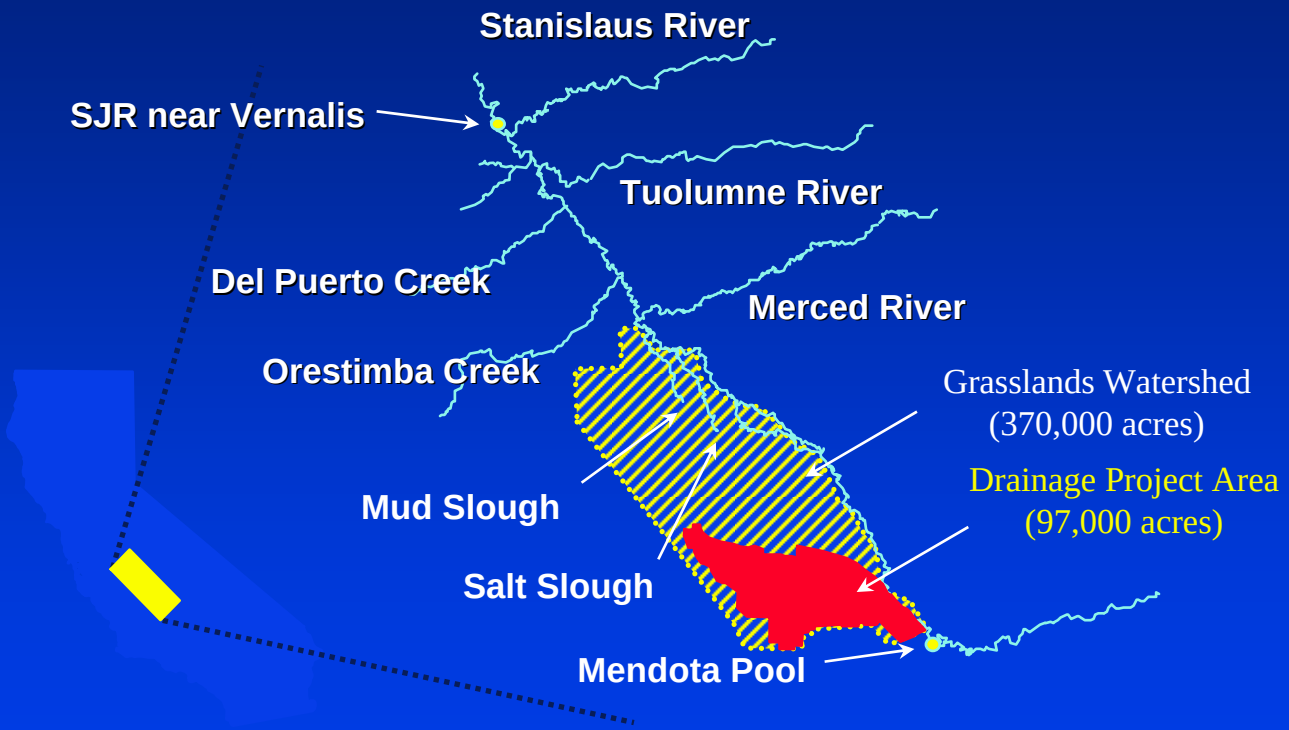
--Closed Basin

--Subsurface, tile drainage collected in evaporation basins

--Waterfowl deformities found

--Placed under WDRs (initial 1986; final 1993)

Lower San Joaquin River Basin



Selenium Control Program Phase I

1986 Basin Plan Amendment

--Drainage reduction thru irrigation management

--Drainage Management Plans required

--Selenium WQO set at 5-ug/L (USEPA)

Selenium Control Program Phase I

Results

--Selenium loads decreased

--San Joaquin River water quality improved

--**Wetland channel water quality degraded**

--Decreased dilution flows

Selenium Control Program *Phase II*

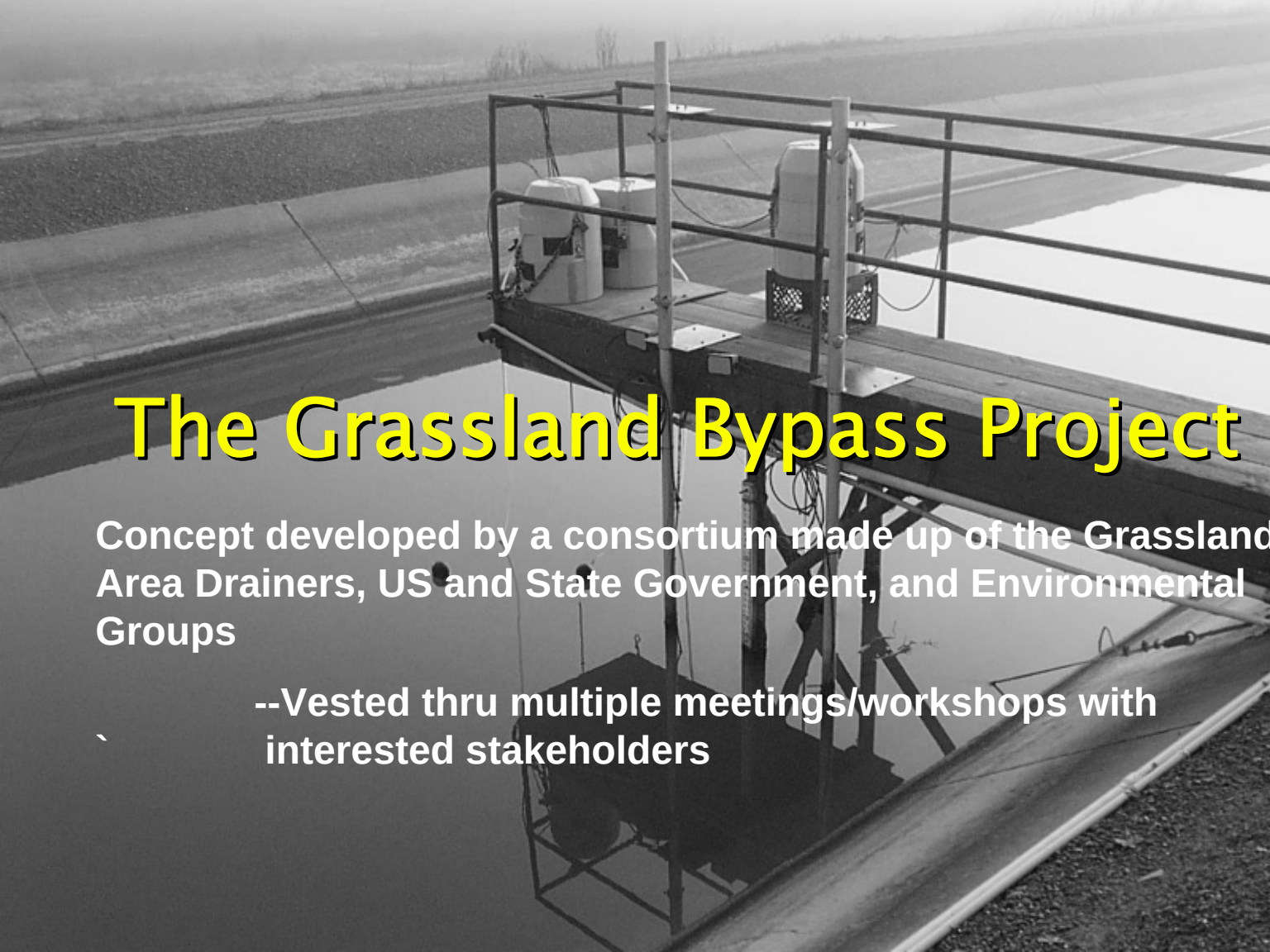
Regroup

--Irrigation management not complete solution

--Required TMDLs/continued exceedance of 5-ug/L objective

--Proposed USFWS wetland water quality objective of 2-ug/L

Drainers under pressure to solve problem or lose ability to discharge



The Grassland Bypass Project

Concept developed by a consortium made up of the Grassland Area Drainers, US and State Government, and Environmental Groups

--Vested thru multiple meetings/workshops with interested stakeholders

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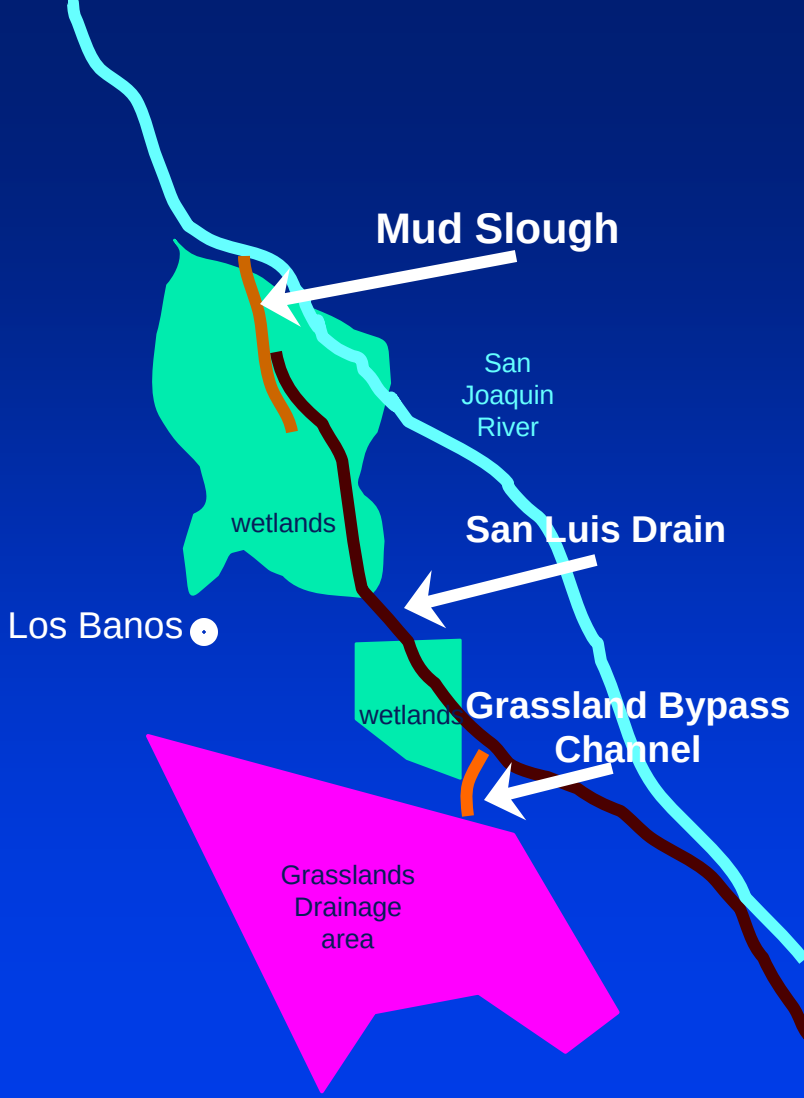
Grassland Bypass Project Concept



The Grassland Bypass Project (GBP) in Brief

- Consolidates drainage into a single channel and routes discharges away from areas utilized by wildlife
- Controls the selenium loads ultimately discharged to the San Joaquin River and Delta
- Reduces drainage discharges

(Ultimate goal is zero discharge)

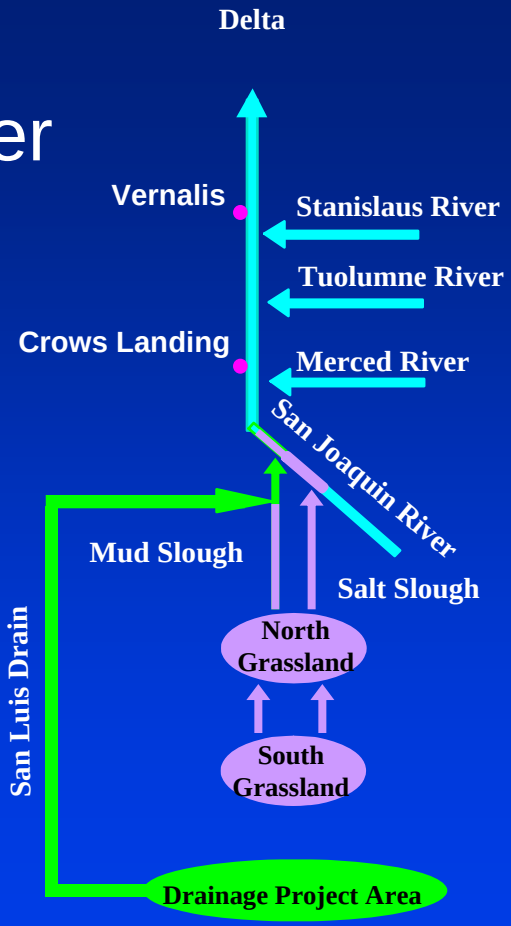
Lower San Joaquin River

Grassland Bypass Concept

Impaired
6-miles natural channels

Improved
31 miles natural channels
75 miles wetland channels
61,810 acres wetlands

Unimpaired



Drainers Enter into Use Agreement with USBR

- Short-term project – maximum 5 years
- In order to continue full five years, the Use Agreement (UA) required that the Regional Board
  - Adopt and implement a Basin Plan Amendment to control subsurface discharges of selenium
  - Issue a Waste Discharge Requirement (WDR) for the GBP

1996 Basin Plan Amendment

1) Prioritized Selenium Control
   - Wetland Supply Channels
   - San Joaquin River
   - Final 6-miles of Mud Slough (north)
2) Revised beneficial uses and selenium water quality objectives
   - 2-ug/L in wetland supply channels
   - 5-ug/L in sloughs and rivers

1996 BPA continued:

3) Established an annual cap of selenium discharges at 8,000 lbs.
4) Regulate selenium discharges through actions that focus on selenium load reductions
5) Use WDRs and prohibitions of discharge to control drainage discharges

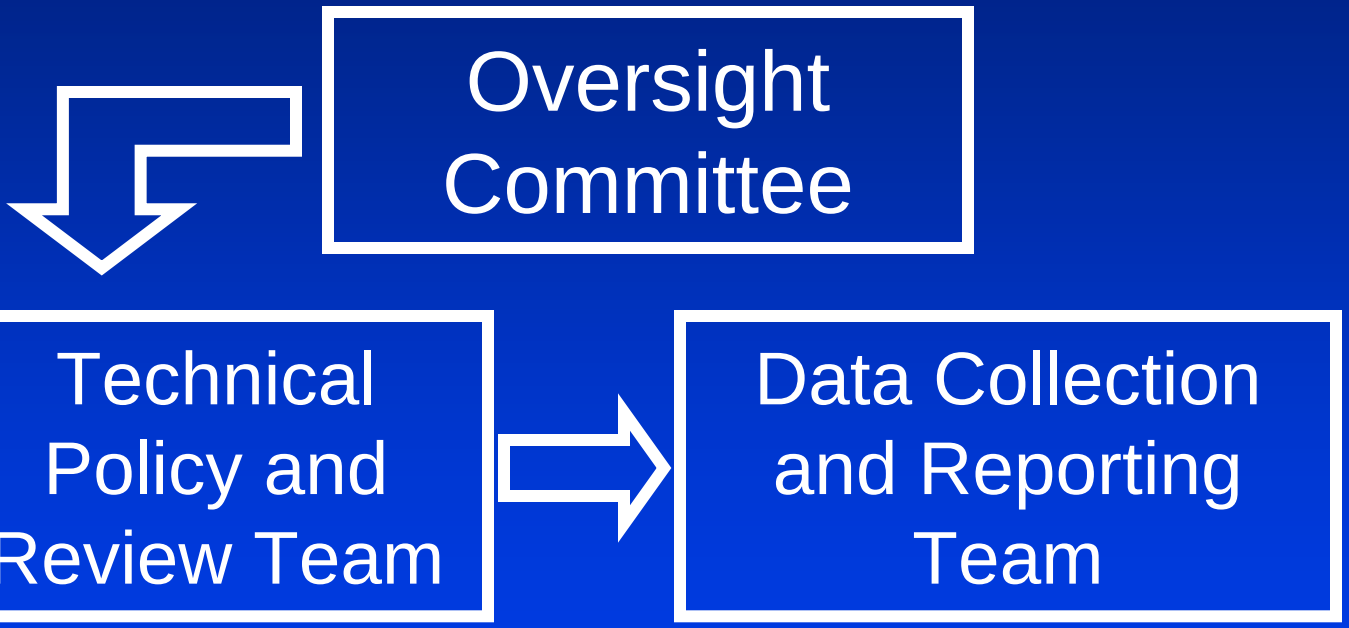
Compliance Schedule for Meeting Selenium Objectives (bold) & Performance Goals (*italics*)

Waterbody/ Water Year Type	10 Jan 1997	1 Oct 2002	1 Oct 2005	1 Oct 2010
Wetland Channels Salt Slough	**2 ug/L monthly ave**			
SJR below Merced Rv - Wet		*5 ug/L monthly ave*	**5 ug/L 4-day ave**	
SJR below Merced Rv - Dry		*8 ug/L monthly ave*	*5 ug/L monthly ave*	**5 ug/L 4-day ave**
SJR above Merced Rv & Mud Slough				**5 ug/L 4-day ave**

Grassland Bypass Project WDR

- Adopted 24 July 1998 (revised 2001)
- Only WDRs in the State regulating discharge from agricultural lands
- Extensive Monitoring and Reporting Program (M&RP)
- Monthly load limits
- Annual load reductions (~5%)
- Load cap of 8,000-lbs/yr

Grassland Bypass Project Oversight

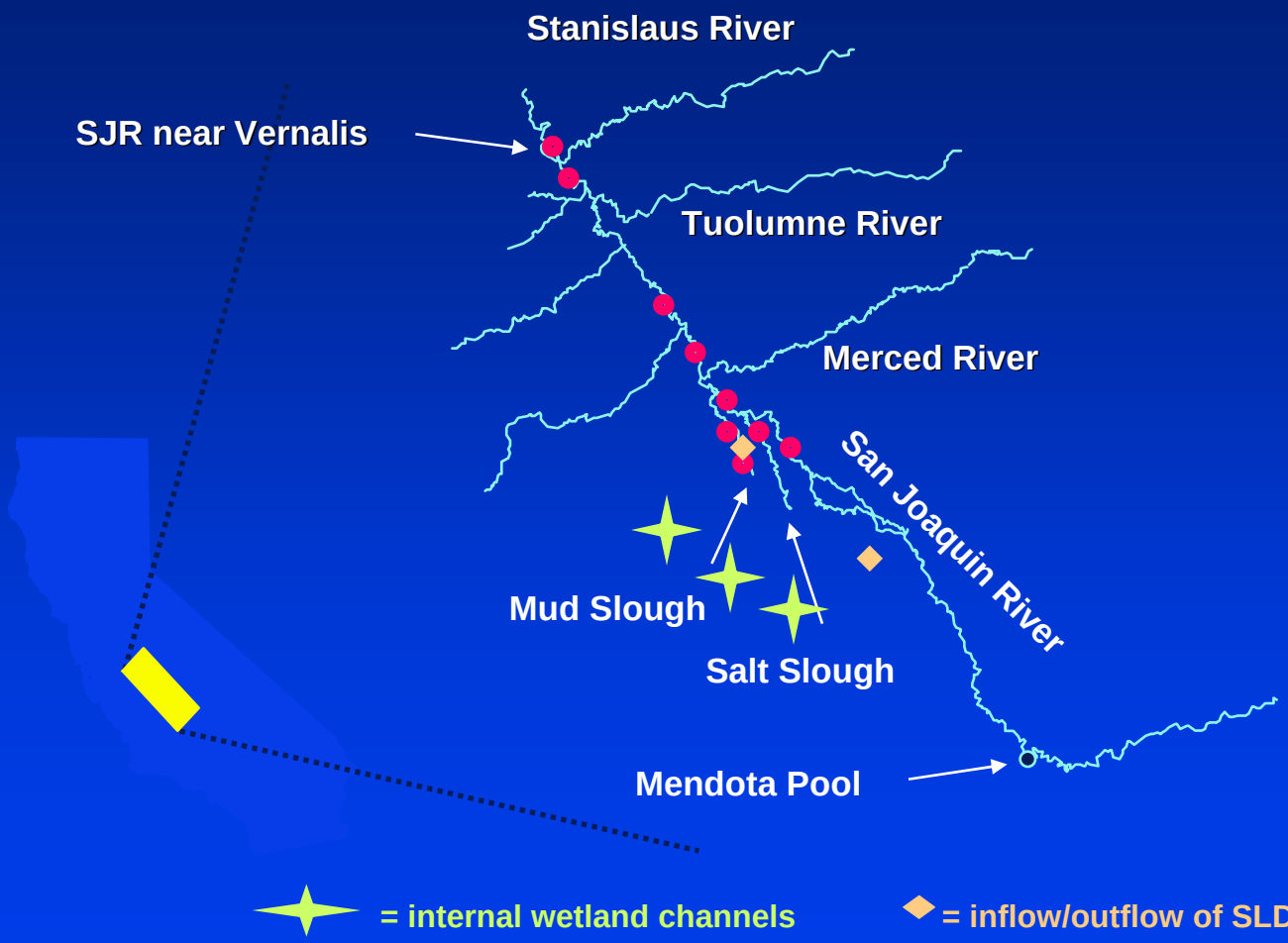


Grassland Bypass Project
Monitoring and Reporting Program

- Who monitors?
  - Dischargers: BOR and SLDMWA
  - CV Regional Board
  - Others: USFWS, USGS, CDFG
- Reporting how often?
  - Monthly
  - Quarterly
  - Annually

DATA AVAILABLE AT
www.sfei.org

GBP Water Quality Monitoring Locations



Overview

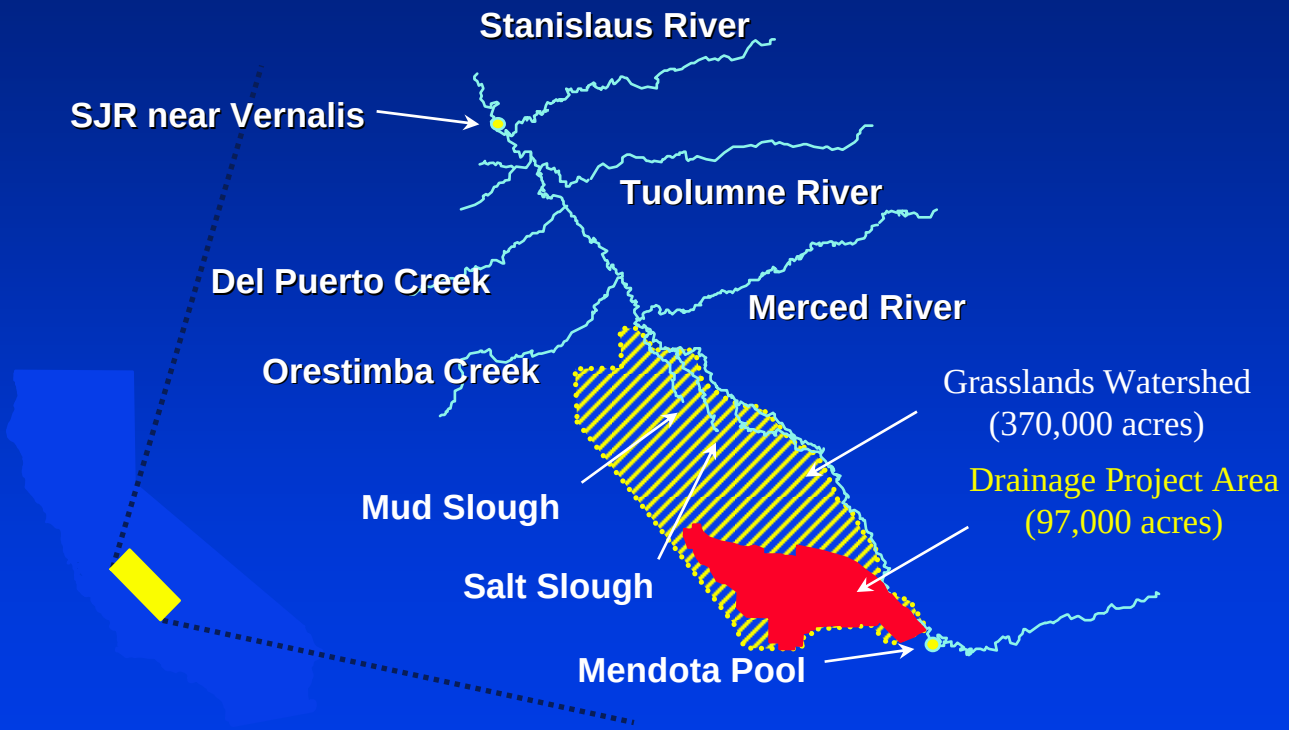
- Background and History
- ***Project Performance to Date***
- ***Future Activities***

Recap:

Use Agreement – contains a number of commitments that must be met in order for use of the San Luis Drain to continue

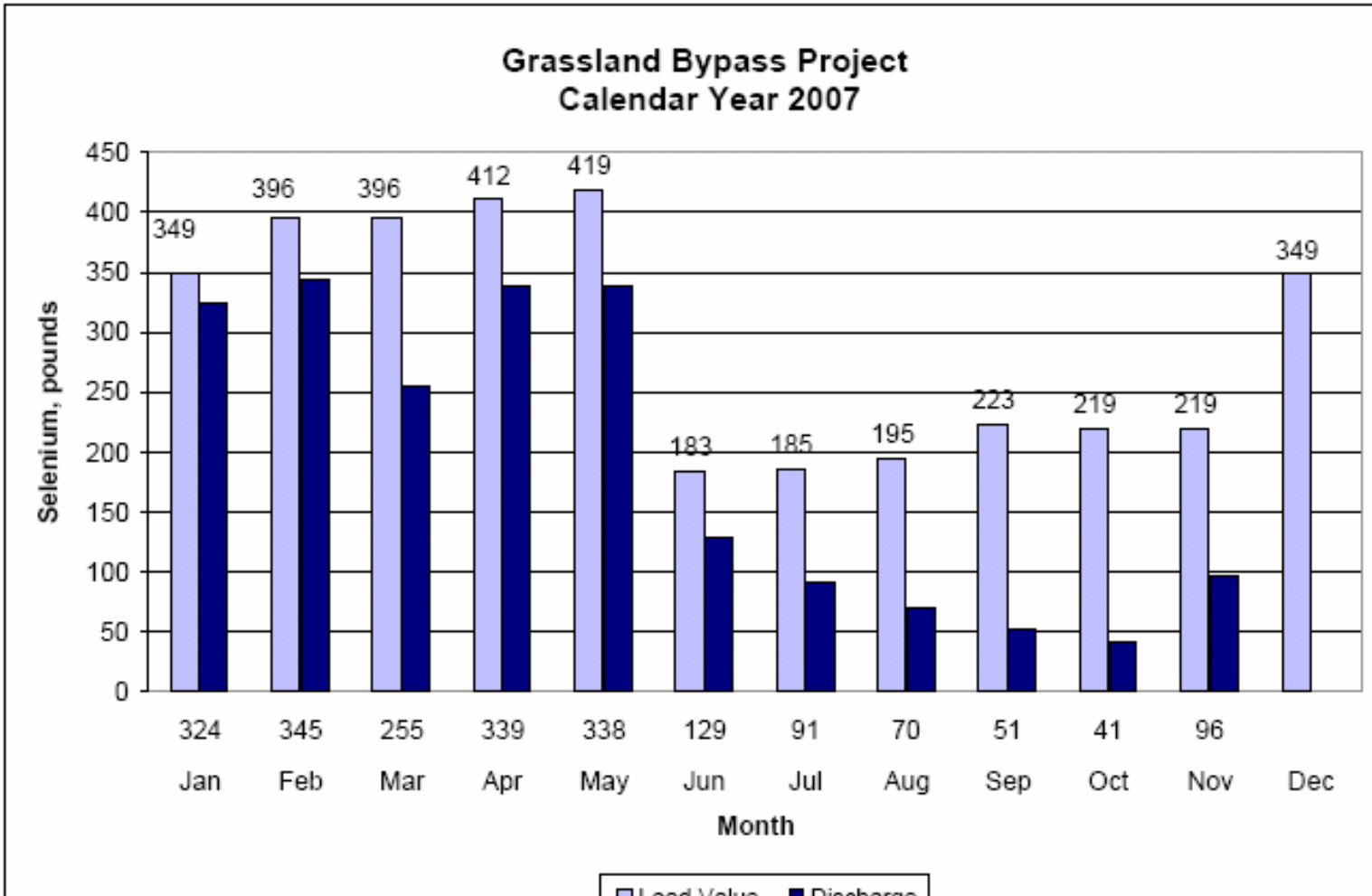
- **Data Collection and Reporting Team (DCRT)** – gathers data to evaluate whether or not Use Agreement commitments are met
- **Waste Discharge Requirements** – Monitoring and Reporting Program

Lower San Joaquin River Basin

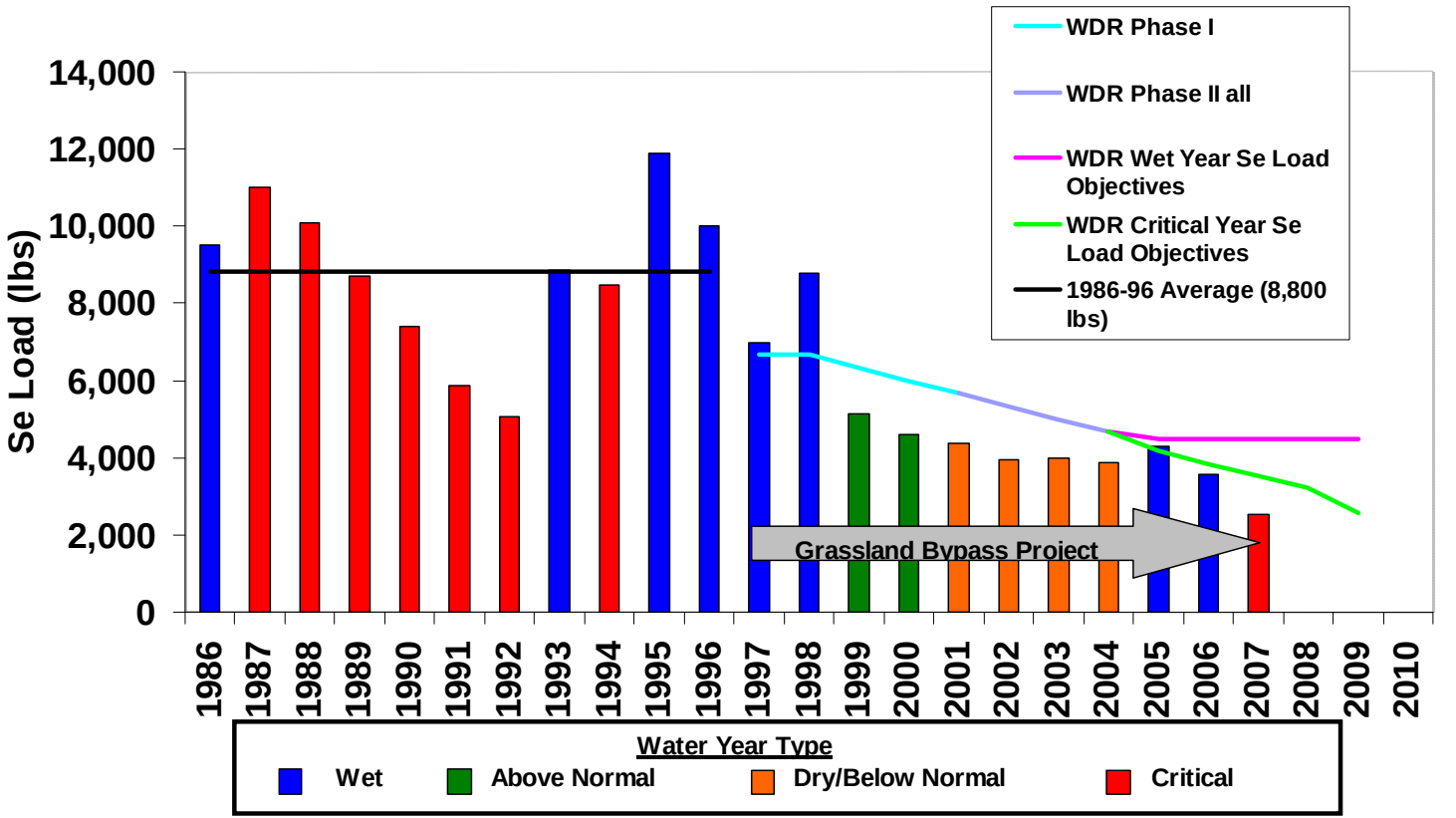


PRELIMINARY RESULT

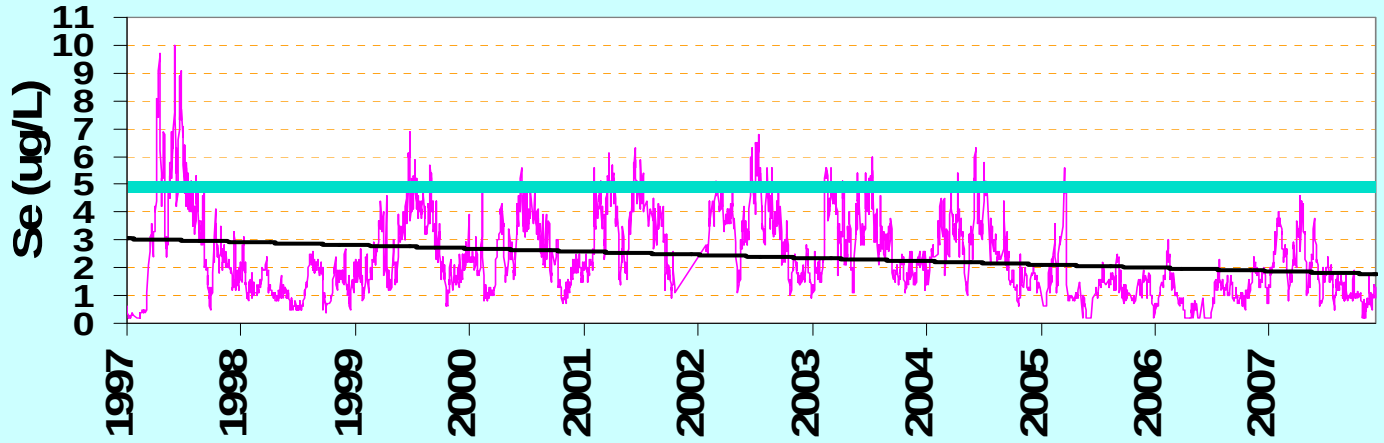
Figure 2b. Monthly selenium discharges from the terminus of the San Luis Drain into Mud Slough compared to load values.



GBP Annual Selenium Discharge




Vernalis
Tuolumne River
Merced River
Crows Landing
San Joaquin River at Crow's Landing
N


Se (ug/L)
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2003
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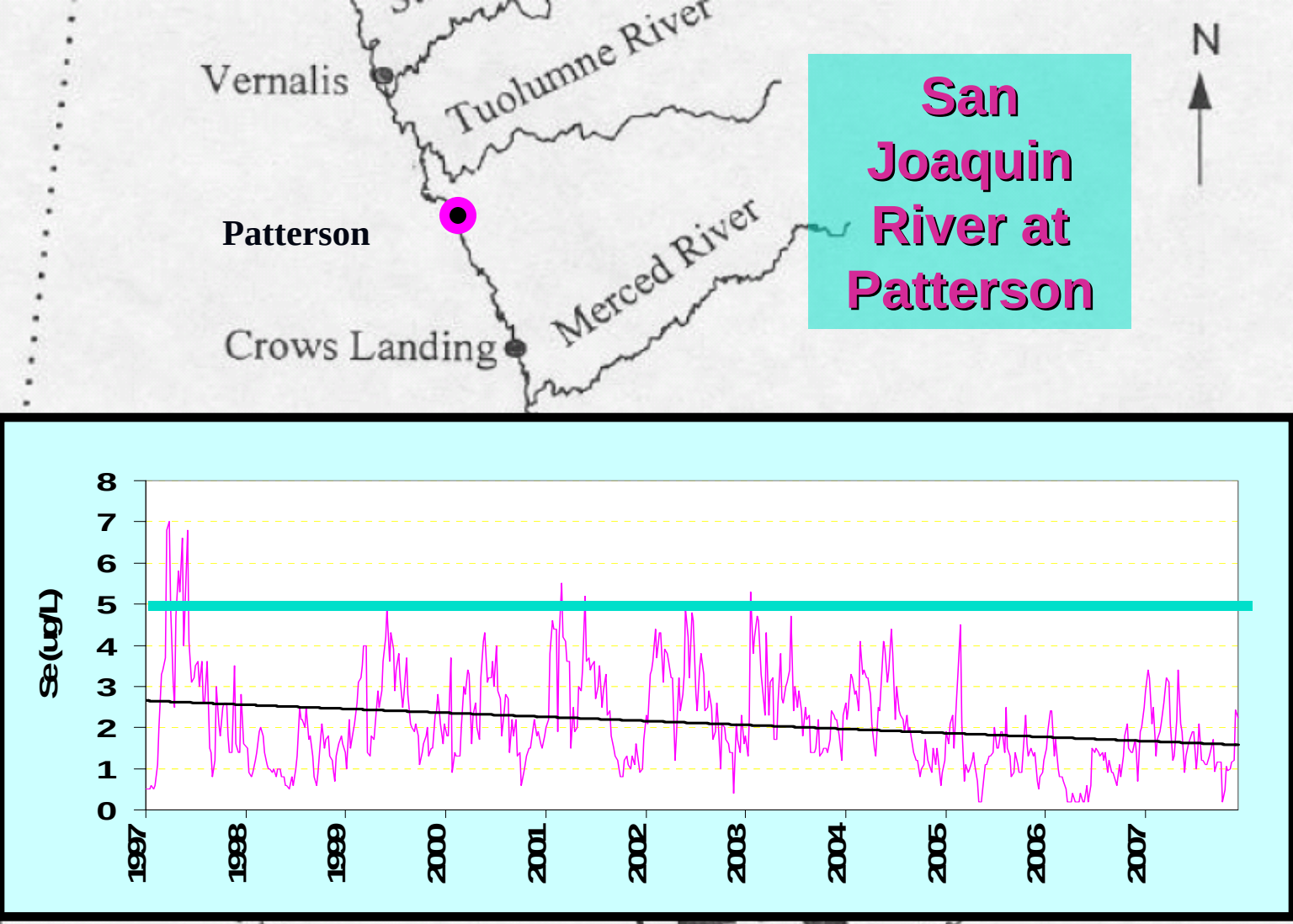
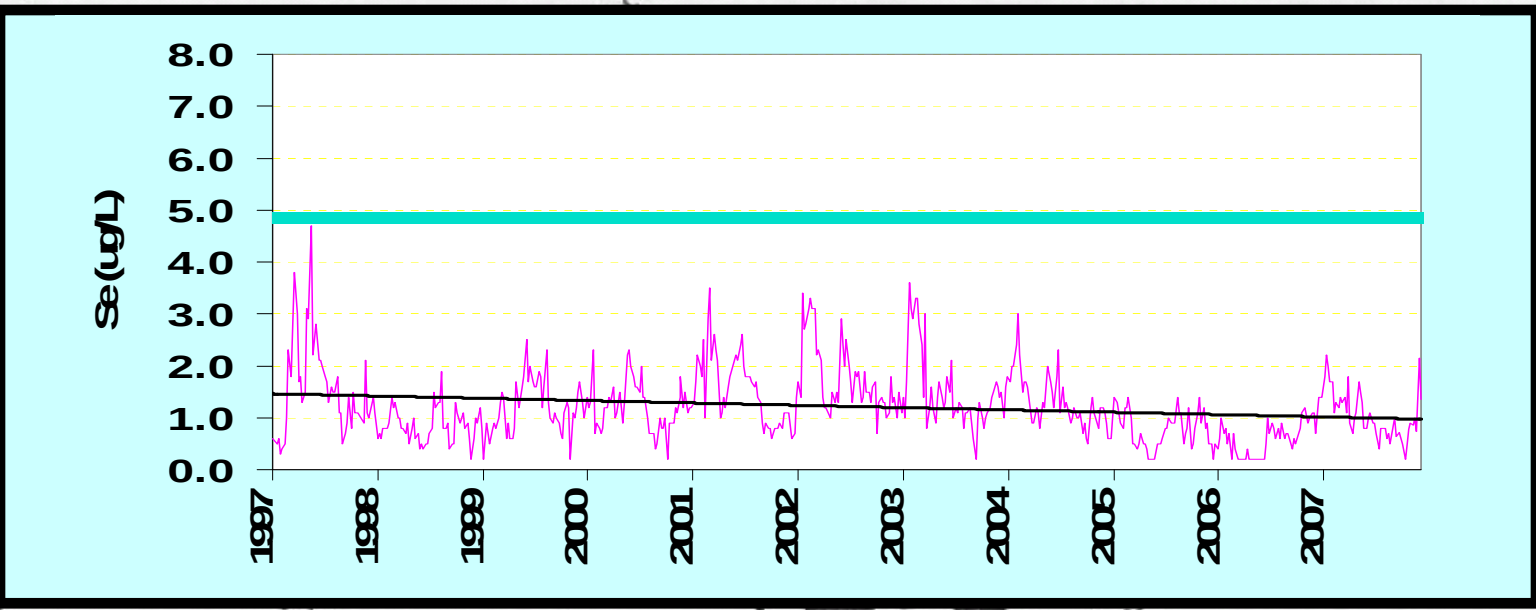
2005
2006
2007


Vernalis
Tuolumne River
Patterson
Merced River
Crows Landing
N
San Joaquin River at Patterson
Se(ug/L)
0
1
2
3
4
5
6
7
8
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007


Vernalis
Maze
Tuolumne River
Merced River
Crows Landing
N
San Joaquin River at Maze Blvd.


Se (ug/L)
8.0
7.0
6.0
5.0
4.0
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1997
1998
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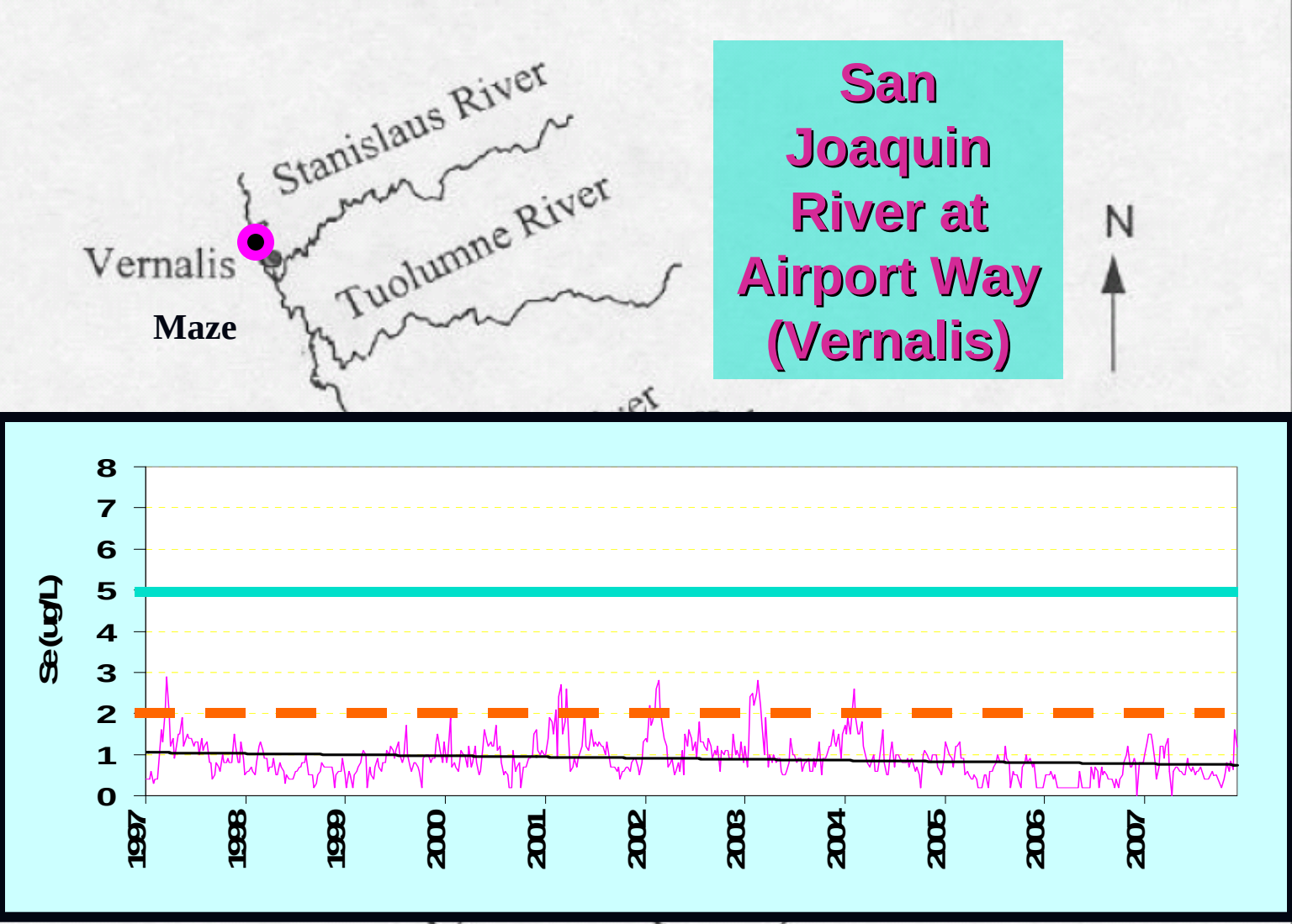
Stanislaus River
Vernalis
Tuolumne River
Maze
San Joaquin River at Airport Way (Vernalis)
N
Se (ug/L)
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7
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1998
1999
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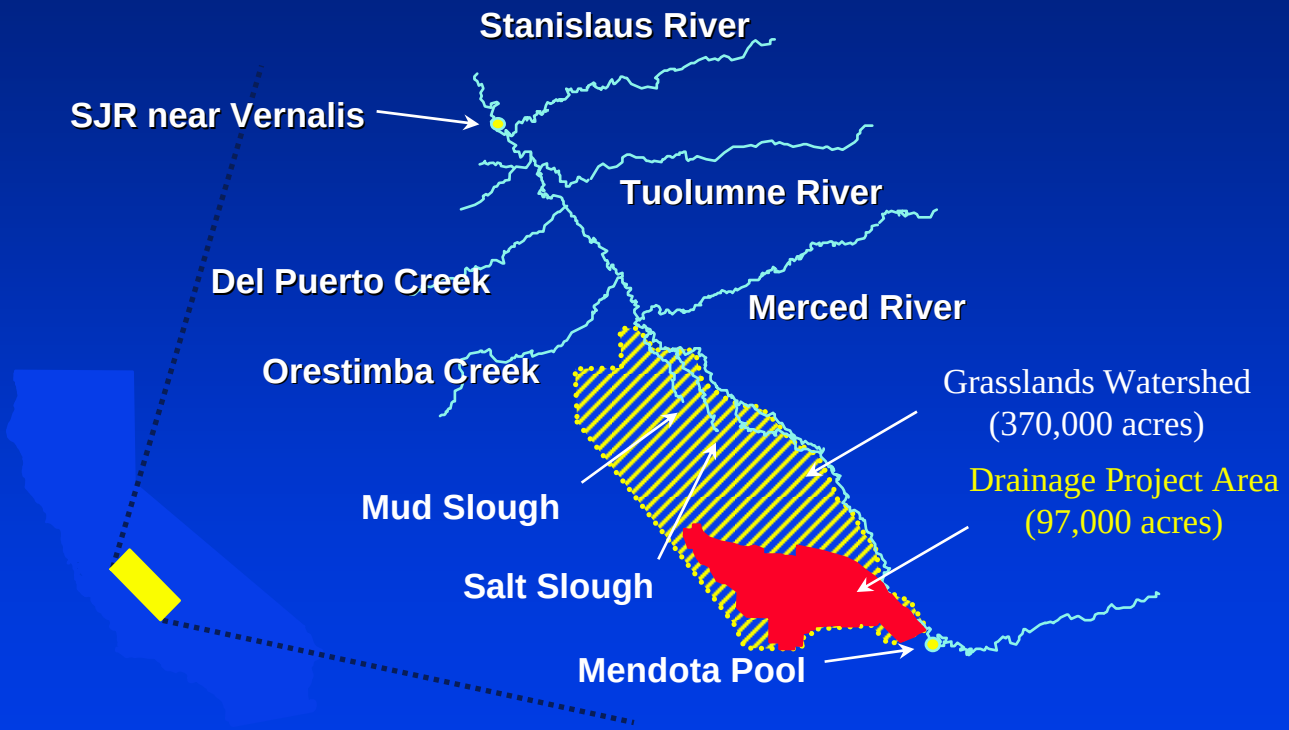
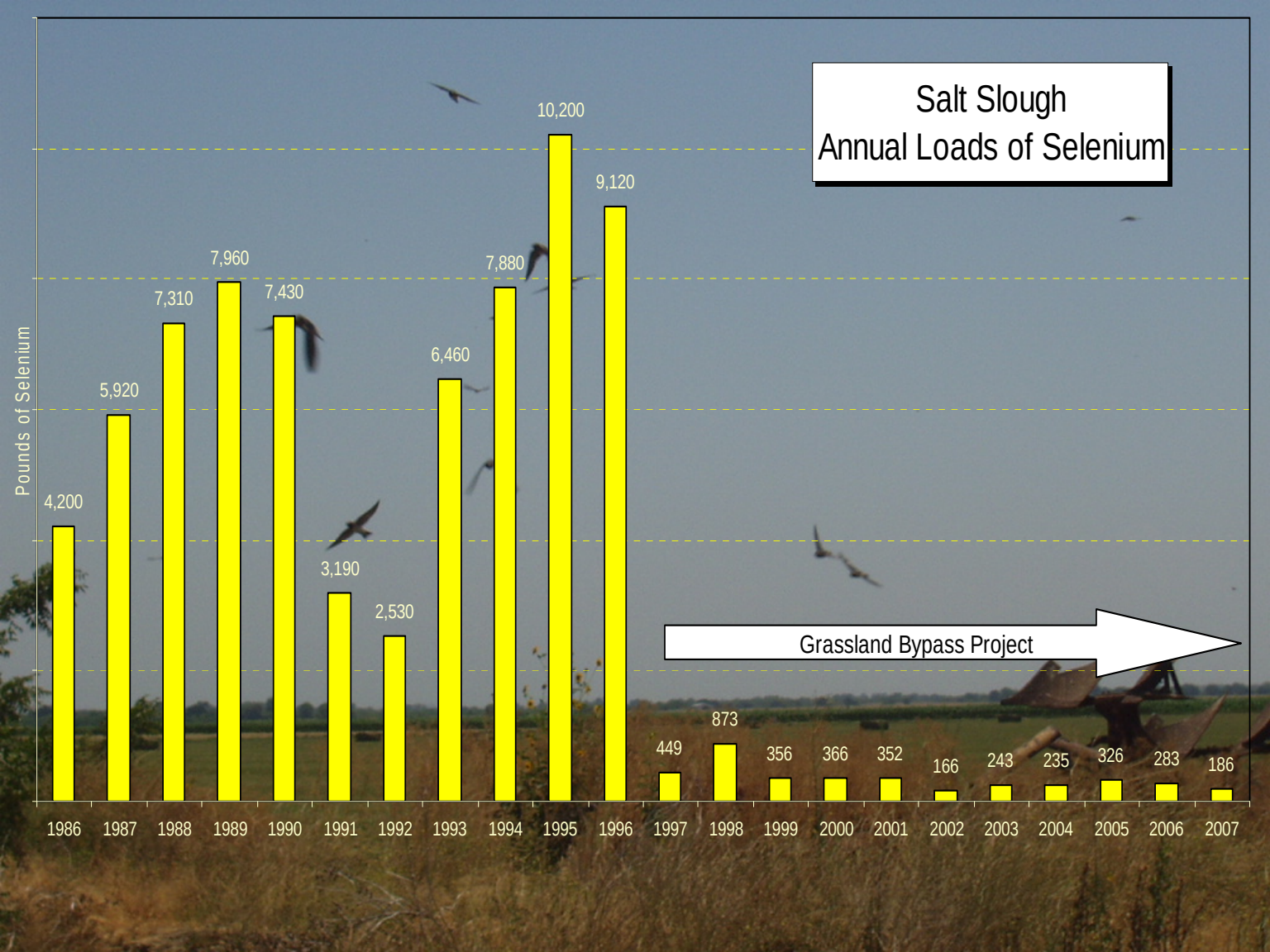
2004
2005
2006
2007

Lower San Joaquin River Basin




Salt Slough
Annual Loads of Selenium
Pounds of Selenium
4,200
5,920
7,310
7,960
7,430
3,190
2,530
6,460
7,880
10,200
9,120
449
873
356
366
352
166
243
235
326
283
186
1986
1987
1988
1989
1990
1991
1992
1993
1994
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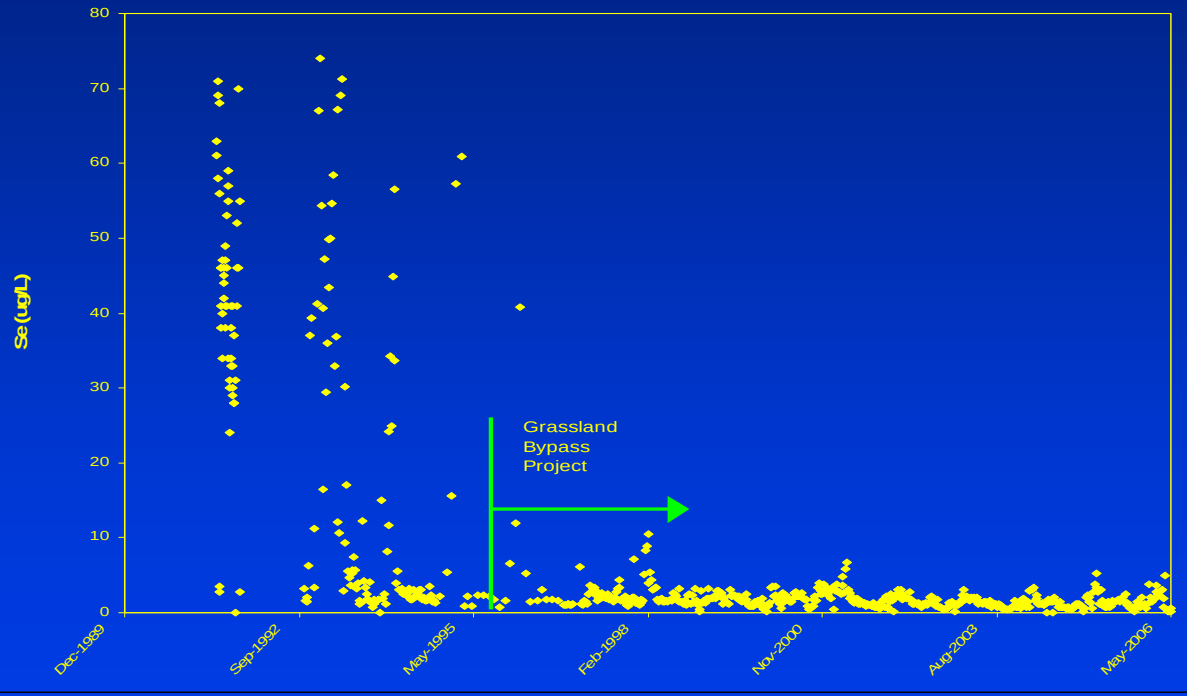
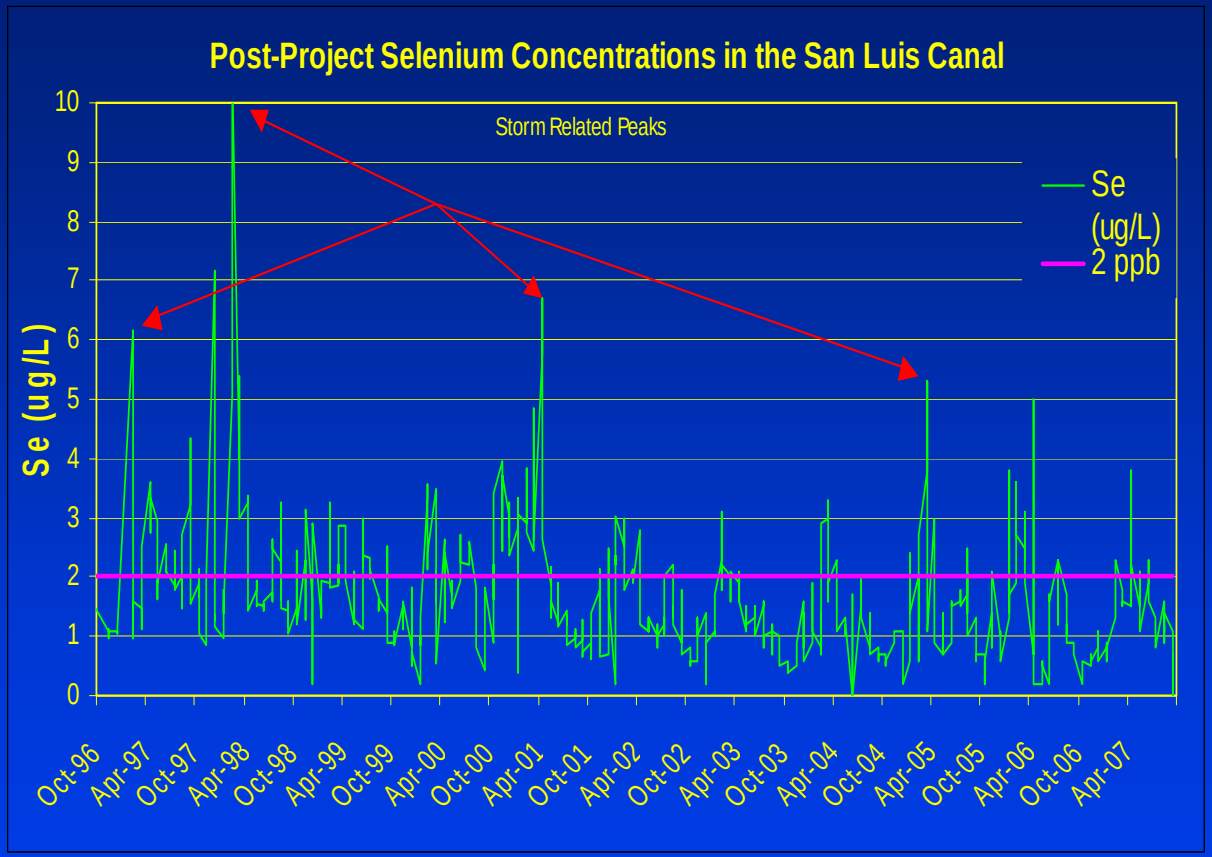
2005
2006
2007
Grassland Bypass Project

Pre-project vs. Project Selenium in the San Luis Canal




Post-Project Selenium Concentrations in the San Luis Canal
Storm Related Peaks
Se (ug/L)
Se (ug/L)
2 ppb
0
1
2
3
4
5
6
7
8
9
10
Oct-96
Apr-97
Oct-97
Apr-98
Oct-98
Apr-99
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Apr-00
Oct-00
Apr-01
Oct-01
Apr-02
Oct-02
Apr-03
Oct-03
Apr-04
Oct-04
Apr-05
Oct-05
Apr-06
Oct-06
Apr-07

Summary Findings Since Oct. ‘96

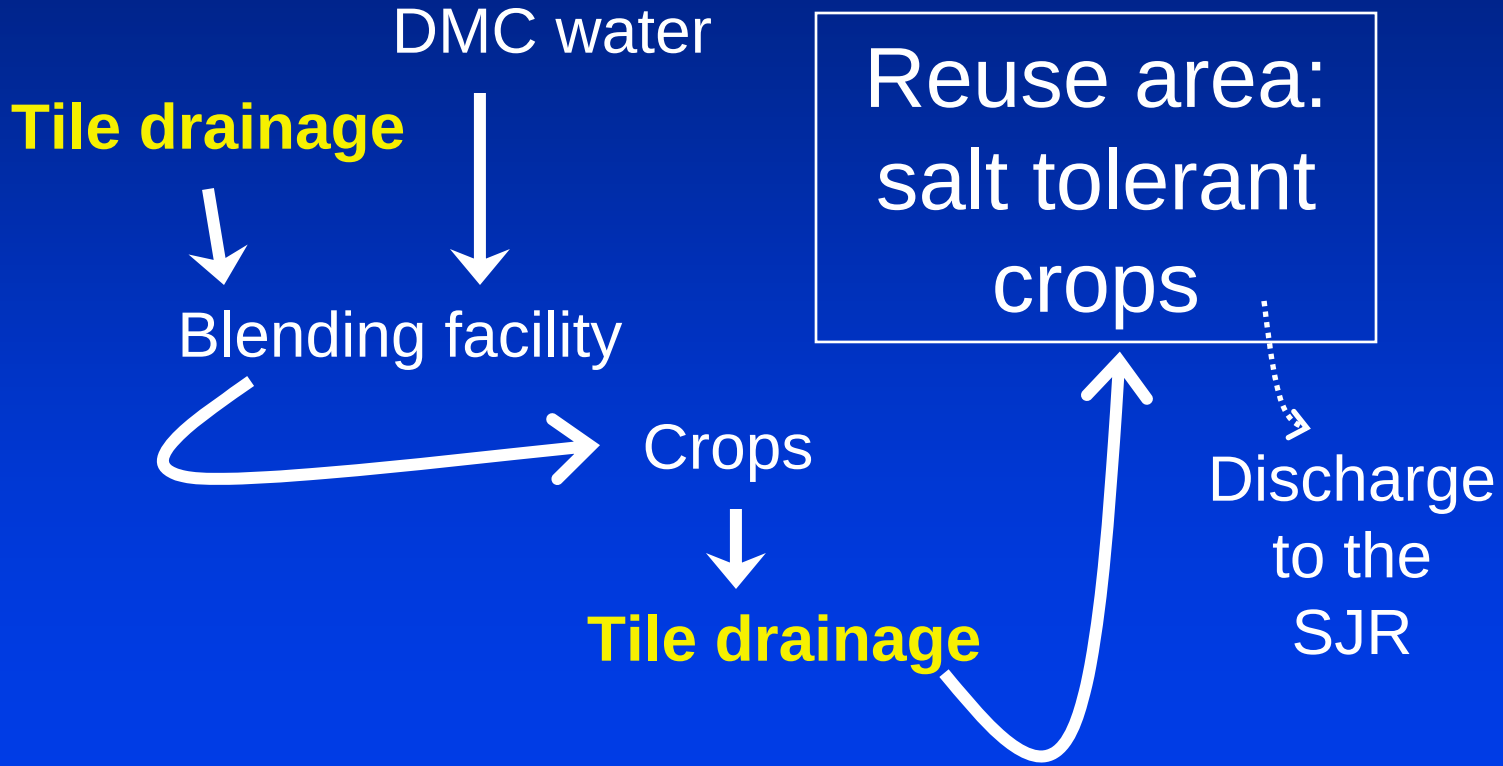
- WQO typically met in wetland supply channels
- WQOs met in Salt Slough and SJR
- Maximum load cap not exceeded

Background:
subsurface drainage

Tile drain

Drain sump

Drainage Management



Control Efforts by the Grassland Area Farmers

- **Farm-Level Components**
  --Tailwater Return Systems
- **District-Level Components**
  --Drain Water Recycling
- **Regional Components**
  --Drainage Reuse

Some Area Projects

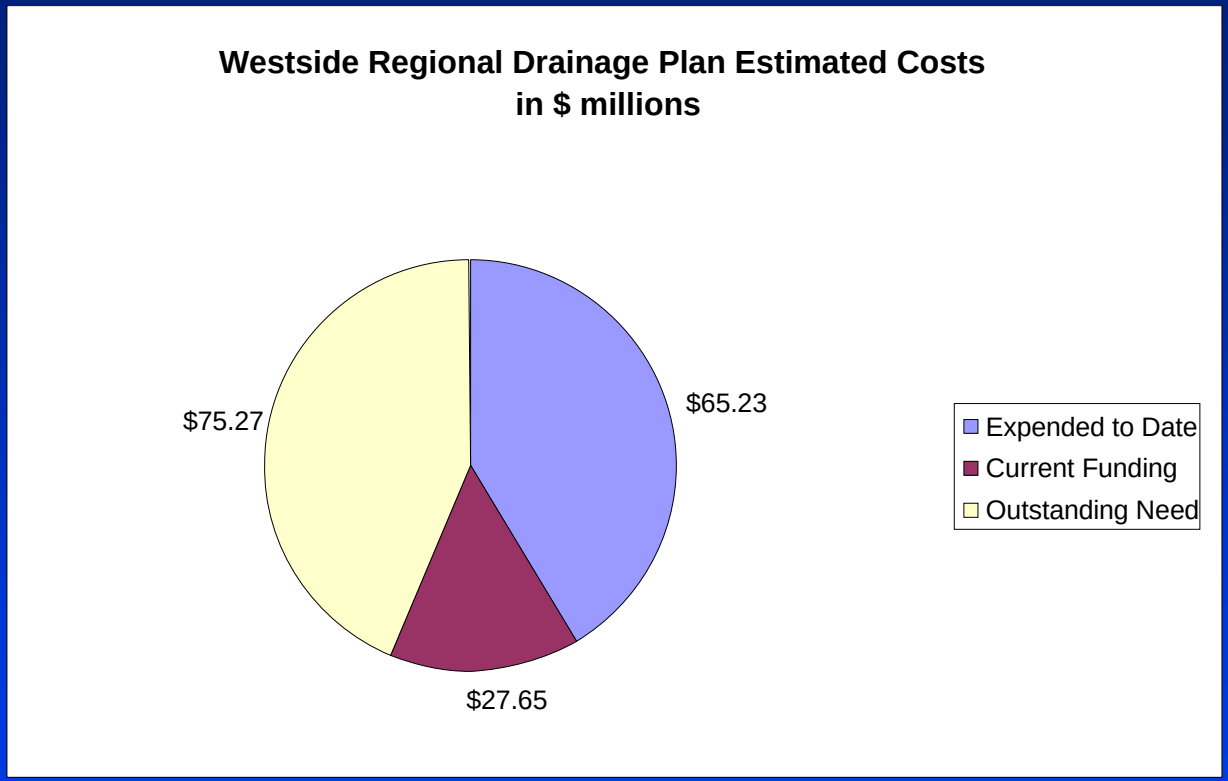
- Recirculation (blending)
- Low-interest loan program for irrigation improvements
- Treatment studies
- Land retirement
- Deep groundwater pumping
- San Joaquin Water Quality Improvement Project (SJRIP)

Regional Components – Drainage Reuse

- Approximately 4,000 acres in DPA (SJRIP)
- Use recycled drainage water on salt tolerant crops
  - Reduce discharge of drainage already produced
  - Provides some yield and evaporation potential as opposed to fallow ground

Conditions when problems occur

- Severe storm events (1996, 1997, 2005)
  - Stormwater plan to minimize impacts of extreme storm events
- (Possibly) excessive pre-irrigation
  - Some districts have adopted pricing structures that provide a strong disincentive for over-irrigating



Source: U.S. Bureau of Reclamation


Future Activities

Outstanding Issues

- Prohibition of Discharge to Mud Slu goes into effect 2010
- Drainers cannot meet Water Quality Objective
- Continuing to ratchet loads down:
  - ~1,000-lbs in critical year
  - ~4,500-lbs in wet year

Getting to Zero

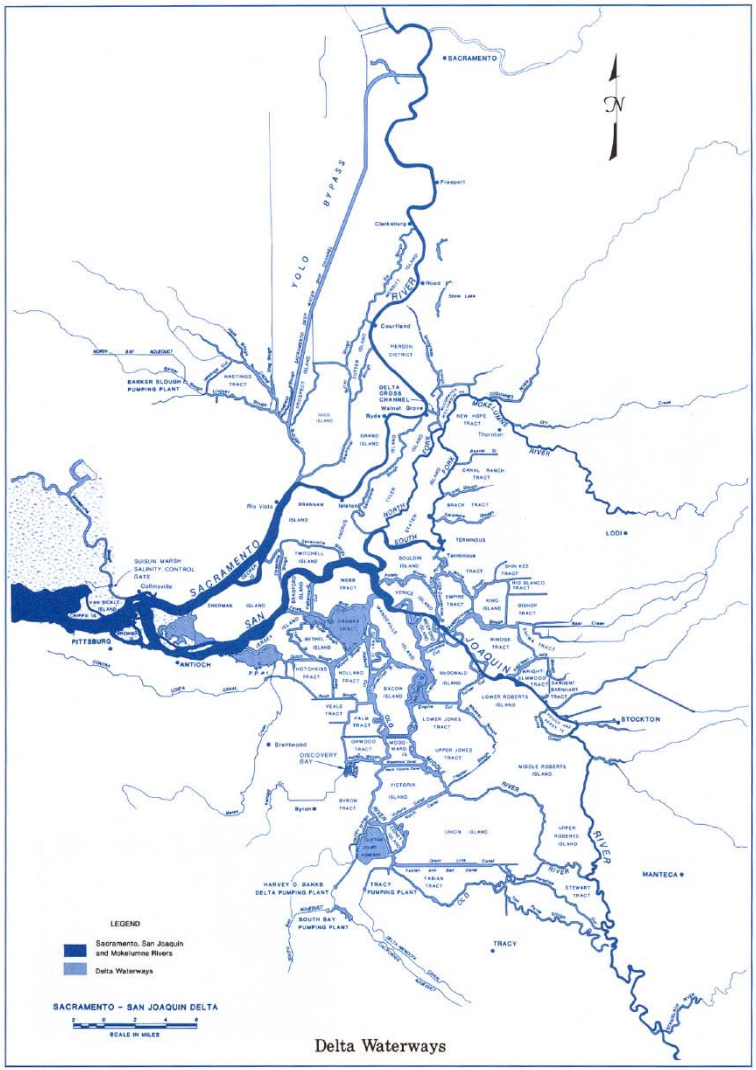
- Drainers seeking time extension on use of the San Luis Drain
  - Scoping, stakeholder input
  - EIS/EIR underway
- Would need Basin Plan Amendment
  - Change compliance schedule for Mud Slu

Getting to Zero

- More source control projects
- Expand reuse area
- Design and install treatment and storage system

Additional Challenges

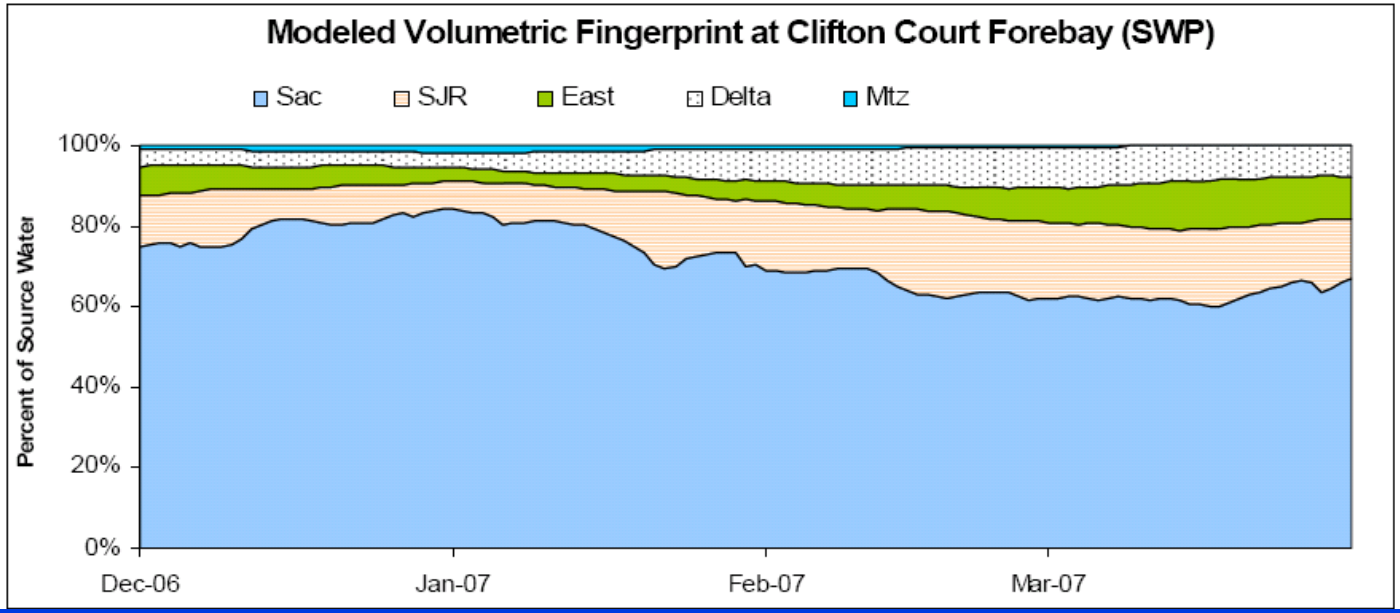
- Storm and flood management
- Salt build-up with lack of flushing
  - Recycling of SJR at pumps



Delta Waterways

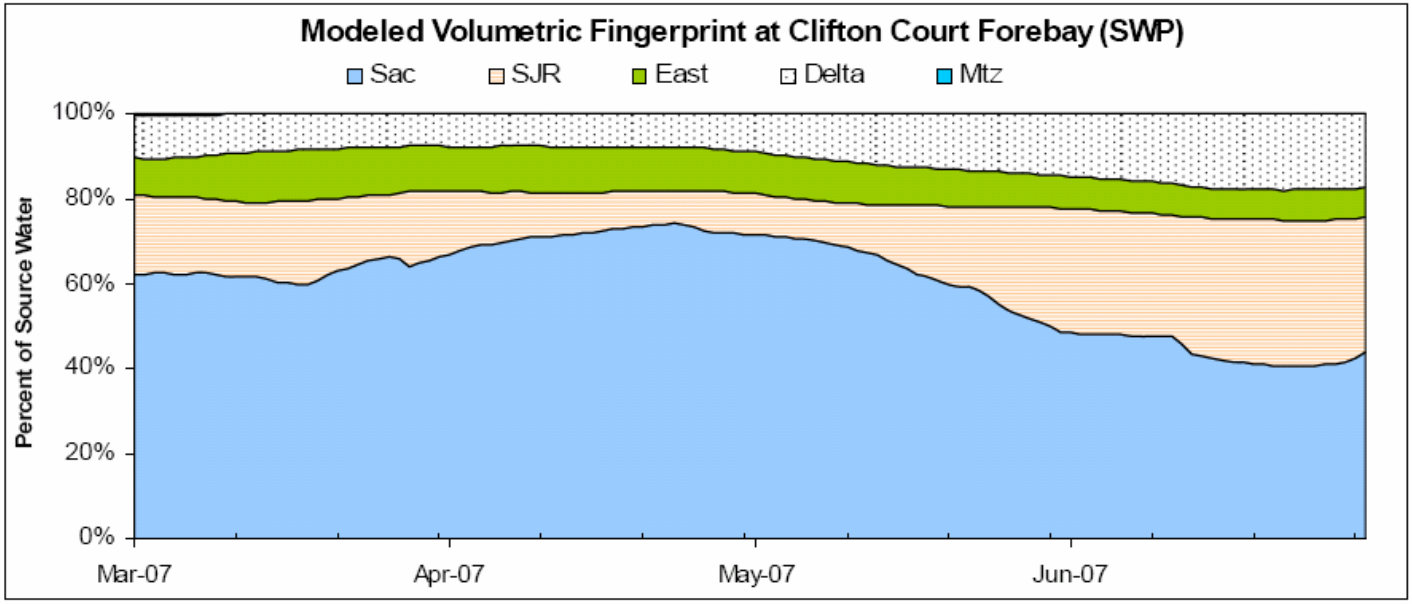
Modeled fingerprint Dec-Mar

4. Volumetric and Constituent Fingerprints



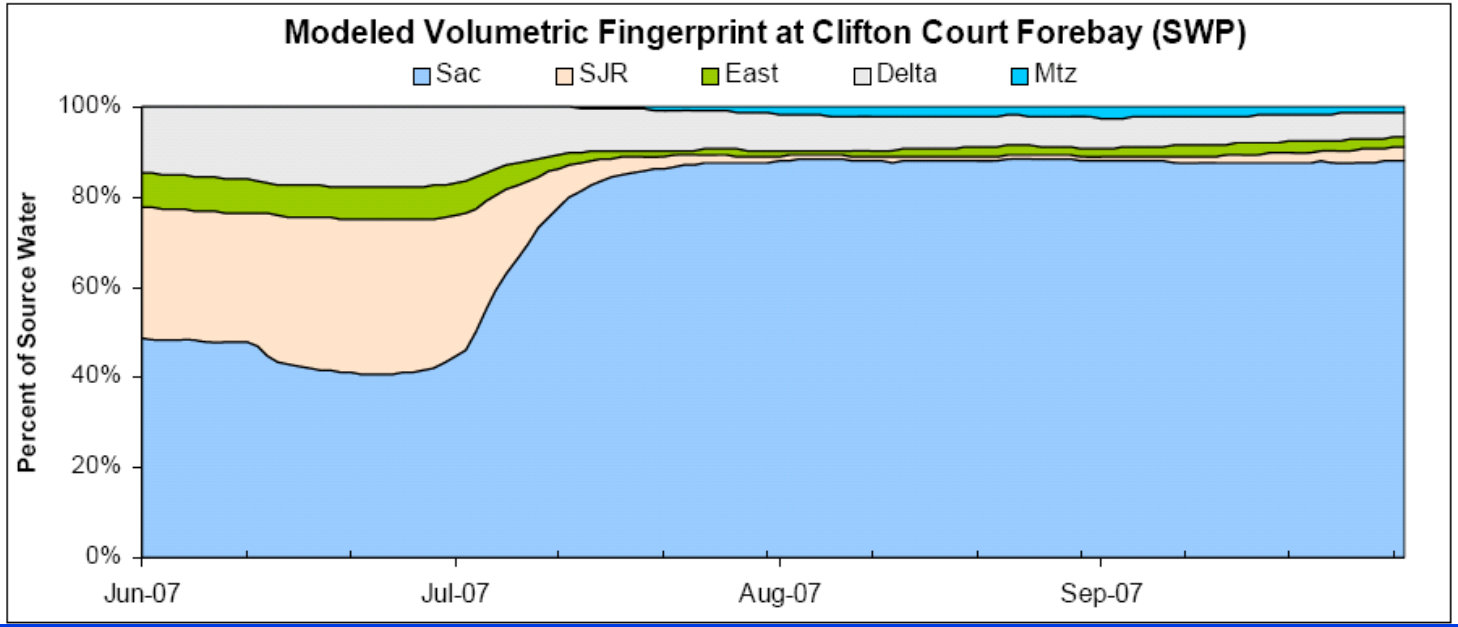
Modeled fingerprint Mar – Jun

4. Volumetric and Constituent Fingerprints



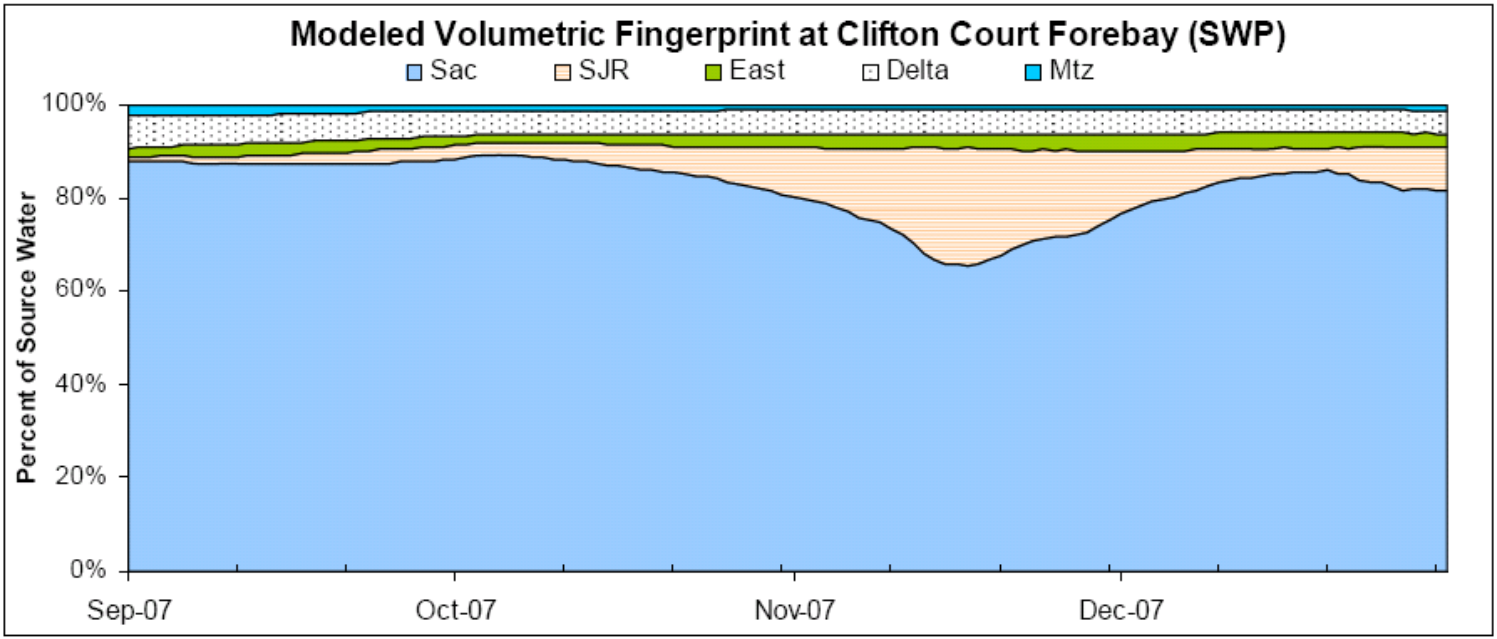
Modeled fingerprint Jun-Sep

4. Volumetric and Constituent Fingerprints



Modeled fingerprint Sep-Dec

4. Volumetric and Constituent Fingerprints



Questions?

Contact:

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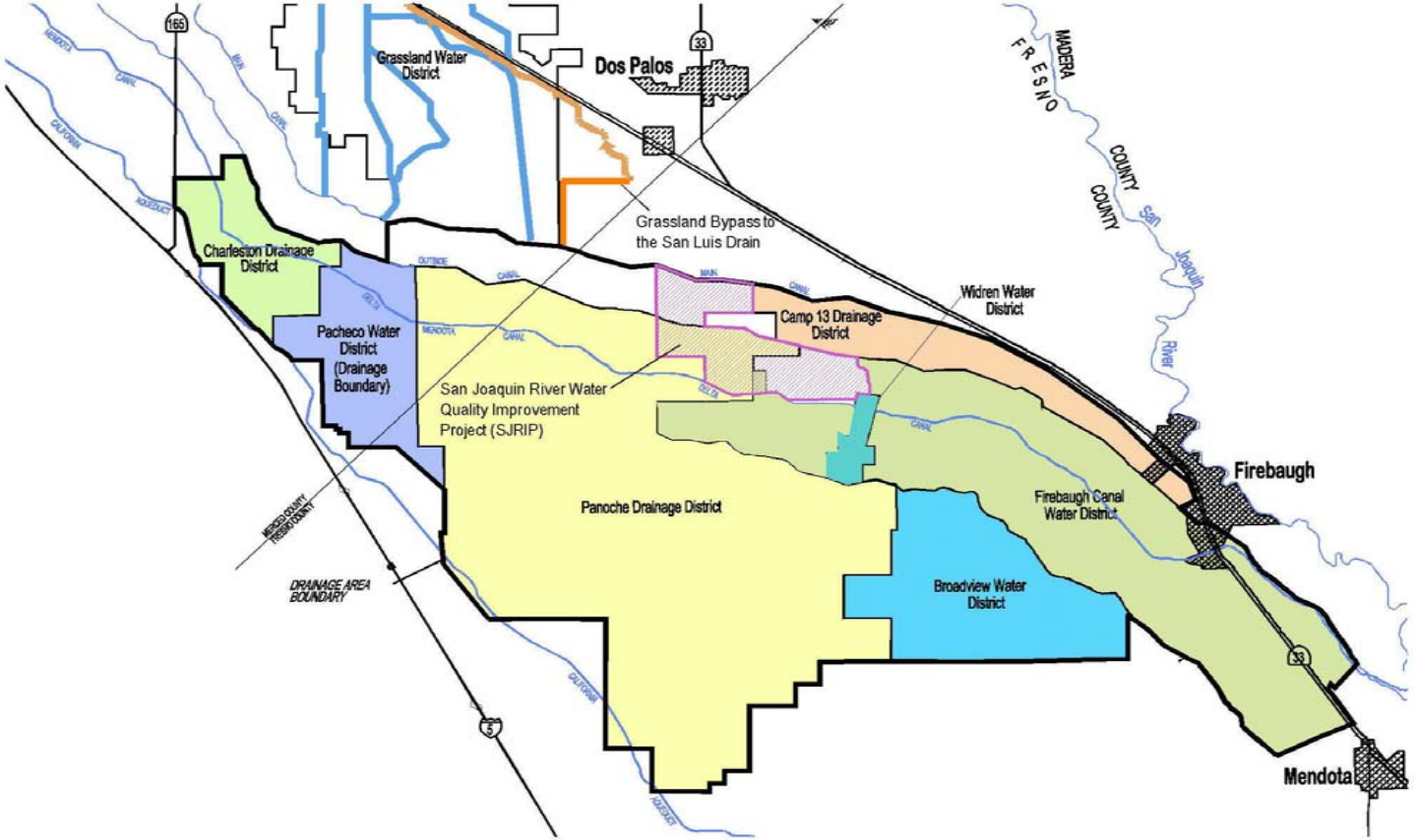
gcismowski@waterboards.ca.gov

Or

Victoria Westman
vwestman@waterboards.ca.gov

Or

Rudy Schnagl
rschnagl@waterboards.ca.gov



Grassland Drainage Area
San Joaquin River Water Quality Improvement Project
Location Map

SUMMERS ENGINEERING, INC.
Consulting Engineers
HANFORD CALIFORNIA
SEPTEMBER 2003


OREGON
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
Redding
LASSEN
1
REDDING
TEHAMA
PLUMAS
GLENN
BUTTE
SIERRA
MENDOCINO
YUBA
NEVADA
COLUSA
SUTTER
PLACER
LAKE
SACRAMENTO
YOLO
EL DORADO
South Lake Tahoe
ALPINE
SONOMA
Santa Rosa
SOLANO
AMADOR
CALAVERAS
2
MARIN
CONTRA COSTA
SAN JOAQUIN
TUOLUMNE
MONO
SAN FRANCISCO
Oakland
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
Fresno
FRESNO
SAN BENITO
6
INYO
MONTEREY
TULARE
3
KINGS
SAN LUIS OBISPO
San Luis Obispo
KERN
SAN BERNARDINO
SANTA BARBARA
Victorville
VENTURA
4
LOS ANGELES
7
Riverside
Los Angeles
8
ORANGE
Palm Desert
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9
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IMPERIAL
San Diego
PACIFIC
OCEAN
NEVADA
ARIZONA
MEXICO
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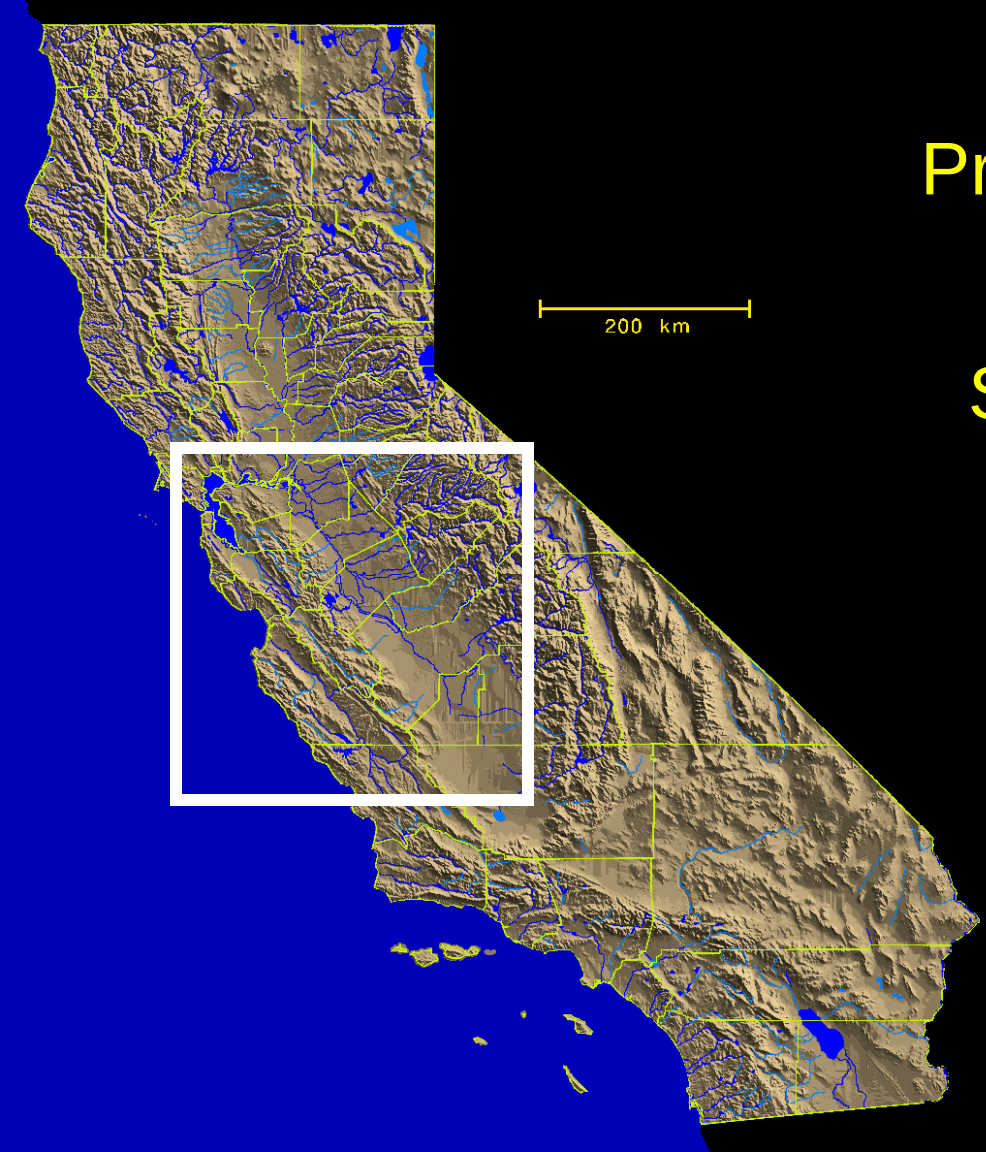
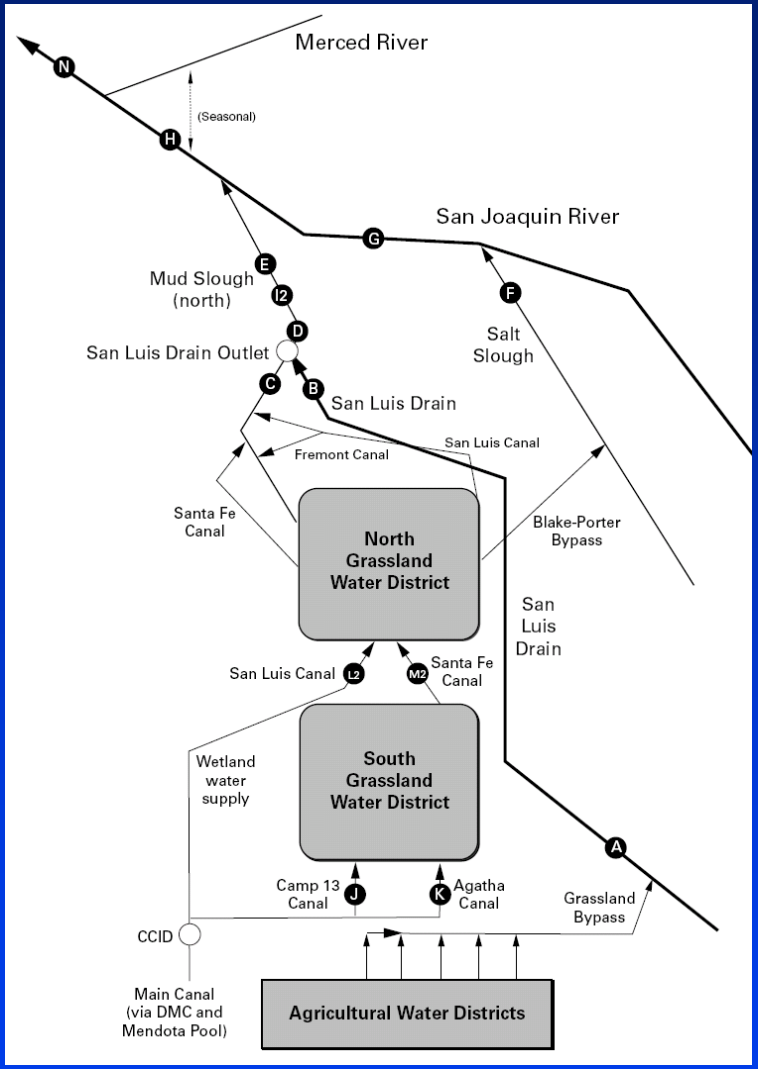


Primary area of interest:

San Joaquin River Basin


Merced River
(Seasonal)
N
H
San Joaquin River
G
E
Mud Slough
(north)
I2
F
D
San Luis Drain Outlet
Salt
Slough
C
B
San Luis Drain
San Luis Canal
Fremont Canal
Santa Fe
Canal
North
Grassland
Water District
Blake-Porter
Bypass
San
Luis
Drain
San Luis Canal
L2
M2
Santa Fe
Canal
Wetland
water
supply
South
Grassland
Water District
A
Camp 13
Canal
J
K
Agatha
Canal
Grassland
Bypass
CCID
Main Canal
(via DMC and
Mendota Pool)
Agricultural Water Districts

Grassland Bypass Project Selenium Load Limits